

**STATE OF SOUTH CAROLINA**  
**DEPARTMENT OF EDUCATION**

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**PRIORITY STANDARDS**

Office of Career and Technical Education  
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## Priority Standards Purpose

The South Carolina Office of Career and Technical Education Priority Standards are to assist schools and districts with identifying the necessary standards that will ensure preparedness of each student to progress to the succeeding course within a CTE Program area or will allow the student to transition seamlessly into the world of work. The standards within a CTE program and/or course are categorized into two subsets; priority standards and supporting standards.

- **Priority Standards** are *"a carefully selected subset of the total list of the grade-specific and course-specific standards within each content area that students must know and be able to do by the end of each school year in order to be prepared for the standards at the next grade level or course. Priority standards represent the assured student competencies that each teacher needs to help every student learn, and demonstrate proficiency in, by the end of the current grade or course"* (Ainsworth, 2013, p. xv).
- **Supporting Standards** are *"those standards that support, connect to, or enhance the Priority Standards. They are taught within the context of the Priority Standards, but do not receive the same degree of instruction and assessment emphasis as do the Priority Standards. The supporting standards often become the instructional scaffolds to help students understand and attain the more rigorous and comprehensive Priority Standards"* (Ainsworth, 2013, p. xv).

Identifying priority standards does not mean disregarding those standards that are not designated as such. All standards are important, necessary, and must be taught, as well as, assessed. All standards to include those identified as priority and those that are identified as supporting are taught and assessed to gain evidence of student mastery. Priority standards allow educators and practitioners to deliberately focus on what is necessary to successfully and adequately allow a student to transition to the next level of training.

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## Agriculture, Food, and Natural Resources Cluster

Course Code	Course Name	Essential Standards
<b>Agricultural Mechanics and Technology</b>		
5660	Agricultural Mechanics and Technology	<p>B.1.2 Select and use hand and portable power tools.</p> <p>B.2.3 Demonstrate how to properly use the table-saw, radial-arm saw, band-saw, jointer, planer, and drill press.</p> <p>D.1.5 Explain the fundamentals of arc welding.</p> <p>D.3.4 Operate an oxy-fuel gas-welding torch.</p> <p>E.1.2 Identify the major parts and systems of small engines.</p> <p>E.2.3 Describe the components of a wiring system.</p>
5610	Agricultural Power Mechanics	<p>A.4.1 Explain the importance of agricultural power mechanics to the industry of agriculture</p> <p>C.1.1 Define internal combustion engine and explain its principal parts.</p> <p>C.4.3 Identify common maintenance practices associated with major engine systems.</p> <p>C.5.1 Explain general maintenance guidelines associated with multiple cylinder engines.</p> <p>C.5.4 Describe the operating characteristics of a diesel engine.</p> <p>D.2.3 Describe the calibration of the systems used in agriculture.</p>
5611	Agricultural Structural Mechanics	<p>A.5.1 Explain the importance of agricultural structural mechanics to the industry of agriculture.</p> <p>B.1.1 Explain how to read project plans and blueprints.</p> <p>B.2.1 Discuss how to select hand tools.</p> <p>B.3.3 Explain how to operate portable power tools.</p> <p>B.3.4 Discuss the operation of stationary woodworking power tools.</p> <p>B.7.4 Explain how to identify building framework components.</p> <p>C.1.3 Describe the methods of heating, cutting, squaring, drawing out, upsetting, bending, twisting, and punching holes in hot metal.</p> <p>C.2.3 Describe how cold metal stock is marked, bent, shaped, cut, drilled, filed, and punched.</p> <p>C.2.4 Describe the methods used in tapping, threading, bolting, and riveting metal.</p>

Course Code	Course Name	Essential Standards
		<p>C.3.1 Explain the fundamentals of fuel gas welding.</p> <p>C.5.4 Describe the procedures and techniques for shielded metal arc welding.</p> <p>E.3.2 Explain wiring materials and installation methods as well as plan and wire circuits to function as specified.</p>
5621	Equipment Operation and Maintenance	<p>A.4.1 Select, Identify and properly use tools utilized in machinery and equipment maintenance.</p> <p>A.5.1 Explain the importance of maintenance and storage of equipment.</p> <p>B.2.1 Identify the kinds and uses of agricultural tractors.</p> <p>B.2.3 Demonstrate the safe operation of a tractor.</p> <p>B.2.5 Perform preventive maintenance procedures.</p> <p>C.1.3 Identify and describe the functions of engine components.</p> <p>C.2.4 Describe a general method of diagnosing small-engine problems.</p> <p>C.3.3 Identify the maintenance practice for diesel engines.</p> <p>C.5.1 Explain the meaning and components of a power train.</p> <p>C.6.1 Define precision technology and explain its role in agriculture.</p>
5604	Agricultural Mechanics and Technology for the Workplace I (2 unit course)	<p>A.4.1 Explain how to create a safe place to work.</p> <p>B.1.3 Explain the benefits of supervised agricultural experience programs.</p> <p>C.1.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.</p> <p>D.1.1 Explain how to read project plans and blueprints.</p> <p>D.2.2 Select and use hand and portable power tools.</p> <p>D.3.3 Demonstrate how to properly use the table-saw, radial-arm saw, band-saw, jointer, planer, and drill press.</p> <p>D.6.1 Identify and use the safety practices that should be observed in doing carpentry work.</p> <p>D.6.5 Lay out a wood construction member by using measuring and marking tools and supplies.</p> <p>E.2.5 Bend and shape hot metal.</p> <p>E.3.4 Select and use cold metal layout tools.</p> <p>E.3.9 Tap and thread cold metal.</p> <p>F.1.4 Explain how to operate fuel gas welding equipment.</p>

Course Code	Course Name	Essential Standards
		<p>F.2.4 Describe the procedures and techniques for shielded metal arc welding.</p> <p>G.1.1 Define the plumbing system and show how it works.</p> <p>I.1.1 Explain precision farming.</p> <p>J.1.1 Explain the purpose of land measurement and legal descriptions.</p>
5605	<p>Agricultural Mechanics and Technology for the Workplace II (2 unit course)</p>	<p>C.4.1 Identify and describe the major causes of accidents</p> <p>C.6.1 Select, Identify and properly use tools utilized in machinery and equipment maintenance</p> <p>D.1.4 Identify and use the safety practices that should be observed in doing electrical work</p> <p>D.7.3 Describe the basic parts of an electric motor</p> <p>E.2.1 Define internal combustion engine and explain its principal parts</p> <p>E.5.5 Perform and conduct small-engine diagnostic tests</p> <p>E.6.3 Identify common maintenance practices associated with major engine systems</p> <p>E.10.1 Explain the operation of a diesel engine</p> <p>E.12.1 Explain the meaning and components of a power train</p> <p>E.13.1 Define precision technology and explain its role in agriculture</p> <p>F.1.1 Identify the kinds and uses of agricultural tractors</p> <p>F.2.1 Describe the importance of equipment in agricultural production</p> <p>F.3.2 Identify the kinds and uses of turf power equipment</p>

Course Code	Course Name	Essential Standards
<b>Biosystems Engineering Technology</b>		
5691	Agricultural and Biosystems Science	<p>A.4.3 Explain safety procedures that should be followed in the agriscience laboratory.</p> <p>B.1.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.</p> <p>C.1.3 Explain the benefits of supervised agricultural experience programs.</p> <p>D.1.1 Explain how the resources soil provides help in supporting life.</p> <p>F.1.2 Identify the various components of animal and plant cells and explain their functions.</p> <p>F.4.2 Identify methods used in agriscience to improve organisms.</p> <p>G.1.3 List characteristics that determine the classification of plants.</p> <p>G.6.1 Describe common pests and their major classifications.</p> <p>G.8.1 Identify the essential nutrients for plant growth.</p> <p>H.1.5 List and explain differences in the life processes of plants and animals.</p>
5692	Biosystems Mechanics and Engineering	<p>D.1.4 Explain the concepts of precision farming and site specific crop management.</p> <p>F.2.1 Identify the steps in creating a safe working environment.</p> <p>F.3.1 Read project plans and blueprints.</p> <p>G.3.1 Safely measure voltage, amperage, resistance, watts, kilowatts and kilowatt-hours.</p> <p>G.5.1 Identify and draw various symbols used in wiring diagrams or schematics.</p> <p>H.1.1 Define internal combustion engine and explain its principal parts.</p> <p>H.5.1 Define force, torque, work, power and energy and explain their relationship to each other and mechanical power transmission.</p> <p>I.1.5 Identify other alternative sources of energy.</p> <p>I.4.3 Explain what renewable resources are used to create biofuels and why they are good sources of energy.</p>

Course Code	Course Name	Essential Standards
5695	Biosystems Technology 3	<p>F.1.1 List examples of economically important compounds.</p> <p>F.2.3 Identify Agricultural crops and by-products used to produce biofuels.</p> <p>H.1.4 Identify organisms, culture environment and substrates needed to produce ethanol from biological growth.</p> <p>H.2.1 List crops used to produce oils.</p> <p>I.1.1 Define heat transfer and condition needed for heat transfer to occur.</p>
5696	Biosystems Technology 4	<p>D.1.1 List the major unit operations used in bioprocessing – pretreatment (crushing/grinding, nutrient addition); bioreactor; heat exchanger; cell/product separations;</p> <p>D.2.1 List the unit operations specific to biodiesel production (from oil to biodiesel).</p> <p>D.3.1 List the unit operations specific to nutraceutical oil production (from sugar to final processed oil).</p> <p>E.2.2 Identify considerations for selecting appropriate heat exchanger for given application.</p> <p>E.3.4 Identify considerations for selecting appropriate separations technology for given application.</p> <p>E.4.4 Use laboratory equipment for mixing liquids in a liquid, solid in a liquid, and gas in a liquid</p> <p>E.5.4 List and identify common biosensors used for detection of substrates and products in bioprocessing, including glucose, pyruvate, ethanol etc.</p>

Course Code	Course Name	Essential Standards
5693	Biosystems Technology Career Development 1 (2 unit course)	<p>A.4.3 Explain safety procedures that should be followed in the agriscience laboratory.</p> <p>B.1.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.</p> <p>C.1.3 Explain the benefits of supervised agricultural experience programs.</p> <p>D.1.1 Explain how the resources soil provides help in supporting life.</p> <p>F.1.2 Identify the various components of animal and plant cells and explain their functions.</p> <p>F.4.2 Identify methods used in agriscience to improve organisms.</p> <p>G.1.3 List characteristics that determine the classification of plants.</p> <p>G.6.1 Describe common pests and their major classifications.</p> <p>G.8.1 Identify the essential nutrients for plant growth.</p> <p>H.1.5 List and explain differences in the life processes of plants and animals.</p> <p>K.2.1 Identify the steps in creating a safe working environment.</p> <p>K.3.1 Read project plans and blueprints.</p> <p>L.3.1 Safely measure voltage, amperage, resistance, watts, kilowatts and kilowatt-hours.</p> <p>M.5.1 Define force, torque, work, power and energy and explain their relationship to each other and mechanical power transmission.</p> <p>N.1.5 Identify other alternative sources of energy.</p>

Course Code	Course Name	Essential Standards
5694	Biosystems Technology Career Development 2 (2 unit course)	<p>F.1.1 List examples of economically important compounds.</p> <p>F.2.3 Identify Agricultural crops and by-products used to produce biofuels.</p> <p>H.1.4 Identify organisms, culture environment and substrates needed to produce ethanol from biological growth.</p> <p>H.2.1 List crops used to produce oils.</p> <p>I.1.1 Define heat transfer and condition needed for heat transfer to occur.</p> <p>J.1.1 List the major unit operations used in bioprocessing – pretreatment (crushing/grinding, nutrient addition); bioreactor; heat exchanger; cell/product separations;</p> <p>J.2.2 List the unit operations specific to biodiesel production (from oil to biodiesel).</p> <p>J.3.1 List the unit operations specific to nutraceutical oil production (from sugar to final processed oil.</p> <p>K.2.2 Identify considerations for selecting appropriate heat exchanger for given application.</p> <p>K.3.4 Identify considerations for selecting appropriate separations technology for given application.</p> <p>K.4.4 Use laboratory equipment for mixing liquids in a liquid, solid in a liquid, and gas in a liquid.</p> <p>K.5.4 List and identify common biosensors used for detection of substrates and products in bioprocessing, including glucose, pyruvate, ethanol, etc.</p>

Course Code	Course Name	Essential Standards
<b>Environmental and Natural Resources Management</b>		
5663	Aquaculture	C.1.1 Define Terms most common to Aquaculture. C.1.3 List the types of aquaculture environments. C.1.5 Identify the species of economic importance. D.2.2 Identify the links in the aquatic food chain. D.2.5 Define sources of water pollution. D.3.2 Identify the basic parts of various finfish, crustaceans, and mollusks. D.3.2 Identify the basic compounds and elements found in water. D.3.3 Explain the importance of oxygen in water quality management. D.3.5 Explain the effects of water pH and quality on crop production. E.1.1 List and define three basic site requirements. E.1.2 Describe facts to consider when evaluating a site's water resources. E.2.1 List types of farm water enclosures. E.2.2 Identify facility requirements for food-fish production.
5626	Environmental and Natural Resources Management	C.1.1 Define and identify types of natural resources. 1.2 Distinguish between renewable and nonrenewable resources. C.2.1 Define ecology and ecosystems. C.2.2 Explain natural selection and succession. C.3.1 Explain how humans use natural resources. 3.3 Identify the urban and rural impacts of natural resource use. C.4.1 Explain the importance of conservation and preservation. C.5.1 Identify basic career information related to environmental science. F.1.1 Explain the meaning of air pollution. F.1.3 Explain the effects of air pollution on humans.

Course Code	Course Name	Essential Standards
5627	Soil and Water Conservation	C.1.2 Describe a mature soil profile. C.2.3 List and define the major types of soil erosion. C.3.2 Describe the main vegetation methods farmers use to control water-caused soil erosion. C.3.3 Describe the main mechanical methods farmers use to control water-caused soil erosion. C.5.1 Explain why land-use planning is important to our ecosystem and to our economy. C.6.1 Identify the soil characteristics that effect soil drainage. E.1.1 Describe the water cycle. E.2.1 Explain the importance of water. E.2.3 Identify methods of water management. E.4.1 Explain the difference between point and non-point source pollution. E.5.1 Define watershed. E.7.1 Define groundwater. E.7.2 List causes of groundwater contamination. G.1.1 Outline several career areas in soil and range management.
5630	Soil and Soiless Research	D.1.1 Explain the chain of events that occur during the germination process. D.4.1 Explain why the seed coat ruptures during germination. D.4.2 Understand how soil condition affects seed germination and seedling establishment. D.4.3 Explain how seedbed preparation affects germination. D.5.1 Identify the importance of photosynthesis. D.7.1 Describe the transpiration process. D.9.1 Explain sexual reproduction of plants and its importance. D.11.1 Explain asexual propagation. D.12.1 Name the nutrients needed for plant growth.

Course Code	Course Name	Essential Standards
5642	Forestry	C.1.2 Explain the importance of forests. C.2.2 Identify the components of forest ecosystems. C.3.3 Describe the economic importance of forests. D.1.2 Explain the functions of the various parts of the tree. E.3.1 Explain how to calculate board feet. E.5.1 Identify the major activities involved in harvesting forest trees. E.6.1 Identify methods of reforestation. F.1.2 Identify forest products. G.1.1 Define urban forestry.
5674	Wildlife Management	C.1.1 Explain the history of wildlife conservation. C.2.1 Define endangerment and extinction. C.3.1 Describe human health problems associated with wildlife. D.1.4 Describe how ecosystems are important in wildlife biology. D.2.1 Describe scientific classification and naming of animal wildlife. D.3.1 Describe and list the types of wildlife habitat. D.6.1 Discuss problems that humans face with wildlife and urban sprawl. F.1.1 Describe the characteristics and types of Reptiles. G.4.1 Explain the four basic habitat requirements.
5602	Outdoor Recreation	C.1.1 Describe hunting as a sport. C.2.1 Explain sport fishing. C.3.1 Discuss safety regulations that apply to boating. C.4.1 Discuss safety regulations that apply to ATV's. C.5.1 Discuss basic survival techniques. D.1.1 Discuss the recreational possibilities on public lands. F.1.1 Discuss kinds of outdoor recreation. F.2.1 Discuss agritourism enterprises.

Course Code	Course Name	Essential Standards
5628	Environmental and Natural Resources Management for the Workplace I (2 unit course)	<p>A.1.1 Define and identify types of natural resources.</p> <p>A.2.1 Define ecology and ecosystems.</p> <p>A.3.1 Explain how humans use natural resources.</p> <p>A.4.1 Explain the importance of conservation and preservation.</p> <p>A.4.2 Identify the effects of humans on the environment.</p> <p>A.5.3 Identify ways in which people can make a difference through recycling.</p> <p>A.6.1 Identify basic career information related to environmental science.</p> <p>B.3.1 Describe information sources for job opportunities.</p>
5629	Environmental and Natural Resources Management for the Workplace II (2 unit course)	<p>C.1.5 Identify the major forest regions of United States.</p> <p>C.2.3 Explain the processes and relationships of natural ecosystems.</p> <p>E.1.1 Explain the history of the National Forest Service.</p> <p>E.4.1 Explain the purpose of prescribed fire.</p> <p>E.6.1 Identify methods of reforestation.</p> <p>I.1.2 Explain the government regulations regarding wetlands.</p> <p>J.1.2 Describe the national policies that impact wildlife conservation.</p> <p>K.6.1 Identify ten game species found in South Carolina.</p> <p>O.1.2 List important regulations that govern hunting.</p> <p>O.2.3 Discuss hunting rights and privileges.</p> <p>O.4.2 Discuss legal regulations regarding fishing and boating.</p>

Course Code	Course Name	Essential Standards
<b>Horticulture</b>		
5650	Introduction to Horticulture	<p>A.3.2 Identify the FFA proficiency awards.</p> <p>A.3.3 Explain various team and individual Career Development Events.</p> <p>B.1.2 Define supervised agricultural experience.</p> <p>B.1.3 Explain the benefits of supervised agricultural experience programs..</p> <p>C.2.2 Explain how to prepare for a horticulture career.</p> <p>E.1.1 Describe the system used for naming and classifying plants.</p> <p>E.1.2 Identify the major groups of plants.</p> <p>E.1.3 Describe the differences between annuals, biennials, and perennials.</p>
5634	Floriculture	<p>C.1.1 Describe the scope of the international flower market in the florist industry.</p> <p>D.1.1 Explain the basic requirements of cut flowers.</p> <p>E.1.2 List the principles of design.</p> <p>E.1.3 Explain the concept of proportion.</p> <p>E.1.4 Explain how the concept of balance is applied to floral design.</p> <p>E.2.1 List and describe the major forms (or shapes) used in floral design.</p> <p>E.5.1 Identify and describe supplies and tools needed in floral work</p> <p>E.6.1 Identify types of centerpieces.</p> <p>E.7.3. Identify and describe types of wedding bouquets.</p>

Course Code	Course Name	Essential Standards
5672	Nursery, Greenhouse and Garden Center Tech	<p>C.1.1 Identify greenhouse designs.</p> <p>C.1.4 Describe the functions of the headhouse.</p> <p>C.2.3 Identify greenhouse climate control systems.</p> <p>C.3.1 Discuss the advantages of automated systems.</p> <p>D.1.1 Gather a soil sample using recommended procedures</p> <p>D.2.1 Identify the varieties of flowering plants most profitably grown locally community.</p> <p>D.2.2 Select and prepare a media for a seed flat to germinate bedding plants.</p> <p>D.2.3 Demonstrate the ability to seed a flat or individual container using recommended procedures.</p> <p>D.4.1 Plan and implement a watering schedule using an automatic irrigation system.</p> <p>D.5.1 Demonstrate the ability to examine plants and recognize and report damage resulting from disease and insects.</p> <p>D.8.1 Describe the importance and scope of perennials.</p> <p>E.1.1 Identify types of greenhouse businesses.</p> <p>F.1.2 Describe the different types of nurseries.</p> <p>F.2.2 List and describe the proper nursery field practices.</p>

Course Code	Course Name	Essential Standards
5654	Turf and Lawn Management	<p>C.1.2 List and compare the four types of turf and their functions: lawns, golf courses, sports turf, and utility turf.</p> <p>C.1.4 Discuss career opportunities in the turf grass industry.</p> <p>C.3.1 Identify five related career opportunities in the lawn care industry.</p> <p>D.1.1 Identify the major parts of a typical turf grass plant.</p> <p>D.3.1 Identify the five warm-season turf grass species.</p> <p>D.4.1 Identify the four major cool-season turf grass species and their seeds.</p> <p>E.1.1 Explain the proper times to start a new lawn using both cool-season and warm-season turf grasses.</p> <p>E.1.2 List the items necessary for establishing a new lawn.</p> <p>E.2.1 List the three major benefits of mowing.</p> <p>E.3.2 List 13 nutrients required by turf grasses.</p> <p>E.3.3 Describe the basic lawn fertilization process.</p> <p>E.4.1 Describe the two ways that a lawn loses water.</p> <p>F.1.1 1. After being given the gallons per minute (GPM) flow rate, water pressure (PSI), and field dimensions, the student will use a catalog to select the type and then determine the number of sprinklers necessary to water the entire area.</p>

Course Code	Course Name	Essential Standards
5670	Landscape Technology	<p>C.1.1 Describe how to determine the client's needs and desires.</p> <p>C.4.1 Describe the basic principles of Landscape Design.</p> <p>C.6.3 Identify 50 common landscape plants used in the southeast</p> <p>D.1.2 Explain how to interpret a landscape plan.</p> <p>D.3.4 Describe the methods of planting annuals and perennials.</p> <p>D.3.5 Understand the importance of the use of mulch, landscape fabric, antitranspirants, and climate.</p> <p>E.1.2 Explain recommended watering practices for woody landscape plants.</p> <p>E.2.4 Explain practices for controlling weeds in turf.</p> <p>E.4.1 Describe how to estimate landscape maintenance costs.</p>

Course Code	Course Name	Essential Standards
5655	Sports Turf Management	<p>C.1.1 Identify the career opportunities in the sports turf industry.</p> <p>C.2.1 Identify the three main types of sports fields.</p> <p>C.2.2 Explain the three critical features in sports field management.</p> <p>C.3.3 Understand the use of different turf grasses for different sports fields.</p> <p>D.4.1 List the officially recommended dimensions of a high school soccer field, football field and baseball field.</p> <p>E.1.1 Describe the types of fertilizers used on sports fields.</p> <p>E.2.2 List the factors that must be considered when planning a turf grass irrigation program</p> <p>E.3.6 Identify the common growth regulators used on turf grasses and their advantages and disadvantages.</p> <p>F.1.2. Using the above information, the student will make a scale drawing that clearly shows the following:</p> <ul style="list-style-type: none"> <li>- the location of the incoming water line.</li> <li>- the dimensions and proportional size of the field.</li> <li>- the irrigation supply line connected to the incoming water line.</li> <li>- the irrigation lateral lines.</li> <li>- the location of the sprinklers on the laterals.</li> </ul>
5667	Golf Course Technology	<p>C.1.1 List three major aspects of golf course management.</p> <p>C.2.1 List five jobs and their responsibilities in golf course management.</p> <p>D.1.1 Describe and recognize the rules of the game of golf as applied to the following:</p> <ol style="list-style-type: none"> <li>a. Types of play</li> <li>b. Clubs and Balls</li> <li>c. Player responsibility</li> <li>d. Order of play</li> <li>e. Teeing ground</li> <li>f. Playing the ball</li> <li>g. The putting green</li> <li>h. Moved or deflected balls</li> </ol>

Course Code	Course Name	Essential Standards
		i. Relief situations j. Other forms of play E.1.6 Describe the major management practices used for roughs, bunkers, and hazards. E.2.1 List the mowing height ranges of greens, tees, and fairways. F.3.1 Connect the field wires to a valve solenoid following manufacturer's specifications. H.1.1 Identify five major turf grass diseases: dollar spot, brown patch, pythium blight, snow molds, and spring dead spot.
5652	Horticulture for the Workplace 1	A.1.2 Identify the three major segments of the horticulture industry. A.2.3 List examples of horticulture jobs and careers. D.1.4 1 Demonstrate proper maintenance and storage procedures for tools used in the greenhouse, turf management and landscaping. E.1.1 Describe the system used for naming and classifying plants. E.1.3 Describe the differences between annuals, biennials, and perennials. F.1.1 Discuss the importance of plant propagation. F.1.2 Explain the difference between sexual and asexual propagation. G.1.2 Describe the functions of growing media. G.1.3 Explain the relationship between growing media and plant growth. H.1.1 Explain integrated pest management. H.1.2 Explain best management practices. H.3.4 Identify the safety practices that should be followed when applying pesticides. K.1.1 Identify greenhouse designs. L.1.2 Describe the different types of nurseries.

Course Code	Course Name	Essential Standards
5653	Horticulture for the Workplace II	C.1.1 Describe how to determine the client's needs and desires. C.2.1 Describe the major areas of a residential landscape. C.4.2 Explain how to use the principles of Landscape Design in landscaping. C.6.3 Identify 50 common landscape plants used in the southeast. D.1.1 Read a site analysis or landscape plan. D.1.5 Analyze and prepare soil for planting. E.1.4 Describe how to select and apply mulches to the landscape. F.1.5 Explain how to maintain hand tools. F.2.2 Demonstrate proper use of common landscape installation and maintenance tools and equipment. F.4.2 Explain how to service intake/exhaust and fuel systems. K.1.1 Explain interior plant scraping and its basic design principles.
<b>Plant and Animal Systems</b>		
5624	Agricultural Science and Technology	A.1.1 Name and describe the major areas of agriculture occupations based on the nature of the work. B.2.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA. C.4.1 Identify the steps in planning an SAE Program. D.1.1 Explain how the resources soil provides help in supporting life. E.2.2 Identify common agriscience equipment. G.2.2 Identify the major parts of plants and explain their functions. H.2.3 Describe the importance of anatomy and physiology in animal production.

Course Code	Course Name	Essential Standards
5600	Agribusiness and Marketing	D.1.7 Discuss methods of marketing ag products. D.2.3 What is a commodity futures exchange? D.3.4 Describe the ag trade balance. D.4.1 Describe wholesaling. D.4.2 Describe retailing. F.1.2 Determine the difference between gross salary versus net pay. F.3.3 Discuss the importance of time management on the job.
5614	Agricultural Crop Production and Management	C.1.3 Explain the crucial role plants play in providing food for humans. C.2.5 Describe the concepts of precision farming. D.3.4 Demonstrate soil sampling and analysis. F.1.2 Describe Integrated Pest Management (IPM). F.2.5 Explain how insect and nematode control is monitored. G.1.4 Demonstrate cultural requirements of major grain crops. G.3.3 Discuss cultural practices for oil crops. G.4.2 Apply the cultural requirements of cotton. G.5.2 Explain the cultural requirements of various specialty crops. G.6.2 Apply cultural practices to forage crops. G.7.3 Conduct cultural practices for vegetable crops.

Course Code	Course Name	Essential Standards
5679	Equine Science	D.1.2 Identify various breeds of horses by viewing pictures or live animals. E.2.1 List and discuss the functions of the nine systems of horses. H.1.4 Describe 10 factors to consider when selecting a horse to purchase. H.2.2 List five steps in judging a horse. J.2.3 Discuss different types of breeding programs. K.2.7 Develop a feeding program for horses. L.2.6 Plan a vaccination program for horses. O.1.1 Identify the space requirement for a horse. P.2.7 Outline a proper exercise program for horses.
5657	Food Processing	C.1.1 Explain why proper nutrition is important for all organisms C.2.1 Explain why food packaging is a critical component for the food industry C.4.1 Describe food preservation and its benefits D.1.2 Explain why curing increases the shelf life and palatability of meat products D.5.2 Explain the processing of raw milk and the pasteurization process E.2.3 Explain the need for understanding the physical properties of biological materials E.3.2 Explain why a salt-ice water solution causes food to chill more rapidly and explain why salt is used as the solute in the process of chilling meat E.7.3 Describe how the boiling point of a liquid can be manipulated E.8.1 Explain the effects of microorganisms in the cheese-making process

Course Code	Course Name	Essential Standards
5646	Cattle Production	<p>C.3.2 Describe methods of handling livestock wastes which reduce environmental pollution and are within the guidelines of current laws and regulations</p> <p>D.1.4 Demonstrate proper handling of animals</p> <p>E.2.4 Balance livestock rations using commonly accepted practices including using computers</p> <p>F.1.2 Identify various breeds of beef cattle by viewing pictures or live animals</p> <p>F.2.6 Judge classes of market animals and breeding animals</p> <p>F.3.4 Recommend preventive measures and treatment for beef cattle diseases and parasites common to the local area</p> <p>F.5.2 Describe the facilities and equipment required for beef operations</p> <p>G.1.2 Discuss breeds of dairy cows their characteristics</p> <p>G.2.2 Explore the scientific processes of pasteurization and homogenization in milk processing</p> <p>G.3.3 Review the equipment and procedures involved in milking</p> <p>G.4.5 Evaluate and place animals in order of relative merit</p>
5647	Farm Animal Production	<p>C.3.2 Describe methods of handling farm animal wastes which reduce environmental pollution and are within the guidelines of current laws and regulations.</p> <p>E.1.2 Describe the functions of the parts of the digestive systems of ruminant and non-ruminant animals.</p> <p>E.2.4 Balance livestock rations using commonly accepted practices including using computers.</p> <p>F.1.2 Identify the major breeds of swine by body characteristics.</p> <p>F.2.3 State reasons for placing of four market and four breeding hogs.</p> <p>F.4.1 Describe facilities required for swine production.</p> <p>G.1.1 Identify the common breeds of sheep and goats.</p> <p>G.2.4 Classify market lambs and breeding animals.</p> <p>G.2.5 Classify goats.</p> <p>H.2.2 Identify common breeds of poultry.</p> <p>H.3.2 Describe the management practices for different kinds of poultry.</p>

Course Code	Course Name	Essential Standards
5612	Small Animal Care	C.1.1 Describe the opportunities in the pet care industry. D.2.3 Explain the importance of proper pet health care. E.1.6 Balance a feed ration. F.2.5 Describe the various the grooming techniques used for dogs. K.1.8 Handle grooming tools.
5613	Introduction to Veterinary Science	C.1.2 Describe the opportunities in the pet care industry. D.3.3 Identify the bones of the skeleton and relate them to a live animal. D.4.4 Demonstrate common sites for measuring pulse and collecting blood samples. D.5.2 Identify the basic components of the respiratory tract. D.7.2 Identify the basic structures of the digestive system. E.1.2 List and discuss the six major components of animal diets. F.2.2 Differentiate between signs and symptoms. G.1.1 List the areas checked by the physical examination.
5603	Animal Science	D.1.1 Give an overview of the swine industry in the United States. D.2.1 Give an overview of the beef industry in the United States. D.3.2 Give an overview of the dairy industry in the United States. D.4.1 Give an overview of the sheep industry in the United States. D.5.1 Give an overview of the horse industry in the United States. E.2.1 Explain the significance of performance data to livestock breeders. E.3.1 Evaluate beef, pork, lamb carcasses, and identify primal cuts. E.4.1 Evaluate market animals E.4.2 Evaluate breeding animals E.5.1 Classify a cow using the Dairy Cow Unified Score Card

Course Code	Course Name	Essential Standards
5620	Agricultural Science and Technology for the Workplace (2 unit course)	<p>A.1.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.</p> <p>C.4.1 Identify the steps in planning an SAE Program.</p> <p>D.1.1 Explain how the resources soil provides help in supporting life.</p> <p>E.2.2 Identify common agriscience equipment.</p> <p>G.2.2 Identify the major parts of plants and explain their functions.</p> <p>H.2.3 Describe the importance of anatomy and physiology in animal production.</p> <p>J.1.1 Identify the different areas of agricultural mechanics.</p> <p>K.1.1 Explain the importance of natural resource conservation.</p> <p>L.1.1 Define food science.</p>
5608	Animal Science for the Workplace I (2 unit course)	<p>B.4.1 Identify the steps in planning an SAE Program.</p> <p>C.1.2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.</p> <p>D.4.4 Balance livestock rations using commonly accepted practices including using computers.</p> <p>E.2.1 Describe the function of beef animals and the production system in which they are produced.</p> <p>E.2.6 Judge classes of market animals and breeding animals.</p> <p>E.3.2 Plan a feeding program for the cow-calf herd.</p> <p>E.6.1 Describe the steps in planning for facilities and equipment for beef operations.</p> <p>E.8.1 Describe livestock production problems relating to the environment.</p> <p>F.3.1 Describe the characteristics of the dairy industry in the United States.</p> <p>F.6.5 Evaluate and place animals in order of relative merit.</p> <p>G.1.1 List the main characteristics of the swine enterprise.</p> <p>H.2.2 Explain the procedure for evaluating sheep conformation and goat conformation.</p> <p>I.1.1 Describe the various breeds of horses.</p> <p>J.1.1 Describe the scope and economic importance of the poultry industry.</p>

Course Code	Course Name	Essential Standards
5609	Animal Science for the Workplace II (2 unit course)	C.1.1 Describe the opportunities in the pet care industry D.2.3 Explain the importance of proper pet health care E.1.6 Balance a feed ration F.2.5 Describe the various the grooming techniques used for dogs K.1.8 Handle grooming tools M.3.3 Identify the bones of the skeleton and relate them to a live animal M.4.4 Demonstrate common sites for measuring pulse and collecting blood samples M.5.2 Identify the basic components of the respiratory tract M.7.2 Identify the basic structures of the digestive system N.1.2 List and discuss the six major components of animal diets O.2.2 Differentiate between signs and symptoms P.1.1 List the areas checked by the physical examination

## Architecture and Construction Cluster

Course Code	Course Name	Essential Standards
<b>Building Construction Cluster</b>		
6001	Introduction to Construction	<p>A. Student Organizations</p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p>B. Technology Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> <li>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</li> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> <li>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>C. Personal Qualities and Employability Skills</p> <ol style="list-style-type: none"> <li>1. Demonstrate punctuality.</li> <li>2. Demonstrate self-representation.</li> <li>3. Demonstrate work ethic.</li> <li>4. Demonstrate respect.</li> <li>5. Demonstrate time management.</li> <li>6. Demonstrate integrity.</li> <li>7. Demonstrate leadership.</li> <li>8. Demonstrate teamwork and collaboration.</li> <li>9. Demonstrate conflict resolution.</li> <li>10. Demonstrate perseverance.</li> <li>11. Demonstrate commitment.</li> <li>12. Demonstrate a healthy view of competition.</li> <li>13. Demonstrate a global perspective.</li> <li>14. Demonstrate health and fitness.</li> <li>15. Demonstrate self-direction.</li> <li>16. Demonstrate lifelong learning.</li> </ol> <p>D. Professional Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>13. Demonstrate customer-service skills.</p> <p>NCCER® Contren Core Modules</p> <p>Module A: Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> <li>11. Define safe work procedures around electrical hazards.</li> <li>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</li> <li>13. Complete Performance Tasks</li> </ol> <p>Module B: Construction Math</p> <ol style="list-style-type: none"> <li>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</li> <li>2. Use a standard ruler and a metric ruler to measure.</li> <li>3. Add, subtract, multiply, and divide fractions.</li> <li>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</li> <li>5. Convert decimals to percent and percent to decimals.</li> <li>6. Convert fractions to decimals and decimals to fractions.</li> <li>7. Explain what the metric system is and how it is important in the construction trade.</li> <li>8. Recognize and use metric units of length, weight, volume, and temperature.</li> <li>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>Module C: Introduction to Hand Tools</p> <ol style="list-style-type: none"> <li>1. Recognize and identify various types of basic hand tools used in the construction trade.</li> <li>2. Identify and describe how to use various types of measurement and layout tools.</li> <li>3. Identify and explain how to use various types of cutting and shaping tools.</li> <li>4. Use these tools safely.</li> <li>5. Describe the basic procedures for taking care of these tools.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Module E: Introduction to Construction Drawings/Recommend Blueprint Reading</p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> <li>5. Interpret and use drawing dimensions.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Employability Skills. Use Microburst employability skills or SkillsUSA Career Essentials for softskills. Additional Standards to be addressed will be determined by a pre-test assessment."</p>
6060	Building Construction 1	<p>NCCER Contren® Core Modules</p> <p>Module A: Basic Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsman.</li> <li>2. Explain the role that safety plays in the construction crafts.</li> <li>3. Describe what job-site safety means.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment.</li> <li>6. Follow safe procedures for lifting heavy objects.</li> <li>7. Describe safe behavior on and around ladders and scaffolds.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>8. Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDs (Material Safety Data Sheets).</p> <p>9. Describe fire prevention and fire fighting techniques.</p> <p>10. Define safe work procedures around electrical hazards.</p> <p>11. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</p> <p>Module B: Basic Math</p> <p>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</p> <p>2. Use a standard ruler and a metric ruler to measure.</p> <p>3. Add, subtract, multiply, and divide fractions.</p> <p>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</p> <p>5. Convert decimals to percents and percents to decimals.</p> <p>6. Convert fractions to decimals and decimals to fractions.</p> <p>7. Explain what the metric system is and how it is important in the construction trade.</p> <p>8. Recognize and use metric units of length, weight, volume, and temperature.</p> <p>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them</p> <p>Module C: Introduction to Hand Tools</p> <p>1. Recognize and identify some of the basic hand tools used in the construction trade.</p> <p>2. Use these tools safely.</p> <p>3. Describe the basic procedures for taking care of these tools.</p> <p>Module D: Introduction to Power Tools</p> <p>1. Identify commonly used power tools of the construction trade.</p> <p>2. Use power tools safely.</p> <p>3. Explain how to maintain power tools properly.</p>

Course Code	Course Name	Essential Standards
6061	Building Construction 2	<p>Module C: Introduction to Hand Tools</p> <ol style="list-style-type: none"> <li>1. Recognize and identify some of the basic hand tools used in the construction trade.</li> <li>2. Use these tools safely.</li> <li>3. Describe the basic procedures for taking care of these tools.</li> </ol> <p>Module D: Introduction to Power Tools</p> <ol style="list-style-type: none"> <li>1. Identify commonly used power tools of the construction trade.</li> <li>2. Use power tools safely.</li> <li>3. Explain how to maintain power tools properly.</li> </ol>
6062	Building Construction 3	<p>Module E: Introduction to Blueprints</p> <ol style="list-style-type: none"> <li>1. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>2. Relate information on blueprints to actual locations on the print.</li> <li>3. Recognize different classifications of drawings.</li> <li>4. Interpret and use drawing dimensions.</li> </ol> <p>Module F: Basic Rigging (Optional)</p> <ol style="list-style-type: none"> <li>1. Explain how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site.</li> <li>2. Describe inspection techniques and load-handling safety practices.</li> <li>3. Explain the American National Standards Institute (ANSI) hand signals.</li> </ol> <p>Module G: Basic Communication Skills (SDE Requirement)</p> <ol style="list-style-type: none"> <li>1. Explain techniques for communicating effectively with coworkers and supervisors.</li> <li>2. Demonstrate verbal and written communication skills necessary in the workplace.</li> <li>3. Demonstrate telephone and e-communication skills necessary in the workplace.</li> </ol>

Course Code	Course Name	Essential Standards
6063	Building Construction 4	<p>Unit H: Demonstrating Knowledge and Skills Required to Cut and Join Plumbing Pipe</p> <ol style="list-style-type: none"> <li>1. Use hand tools to cut, clean, ream, and/or flare copper tubing.</li> <li>2. Use hand tools to cut and clean plastic and C/PVC pipe.</li> <li>3. Light, adjust, and use a torch to sweat copper tubing.</li> <li>4. Clean and join PVC pipe.</li> </ol> <p>UNIT I: Demonstrating Knowledge and Skills Required to Install Plumbing Systems</p> <ol style="list-style-type: none"> <li>1. Rough in a water supply system.</li> <li>2. Install plumbing fixtures.</li> <li>3. Pressure test water supply system.</li> <li>4. Repair leaks in valves and lines.</li> </ol> <p>Unit J: Demonstrating Knowledge and Skills Required to Install Drainage Systems</p> <ol style="list-style-type: none"> <li>1. Install a wastewater system for a bathtub, over-flow, and trap.</li> <li>2. Install a wastewater system for built-in lavatories.</li> <li>3. Install a wastewater system for a floor mounted water closet.</li> <li>4. Install a wastewater system for a double kitchen sink with a garbage disposal.</li> <li>5. Rough-in waste lines and vent stacks.</li> <li>6. Install cleanouts on wastewater lines.</li> <li>7. Calculate the slope requirements for wastewater lines.</li> <li>8. Pressure test wastewater lines.</li> <li>9. Clean obstructions from wastewater lines."</li> </ol>
<b>Cabinetmaking</b>		
6080	Cabinetmaking 1	<p>A. Safety</p> <ol style="list-style-type: none"> <li>1. Review school safety policies and procedures.</li> <li>2. Review classroom safety rules and procedures.</li> <li>3. Review safety procedures for using equipment in the classroom.</li> <li>4. Identify major causes of work-related accidents in office environments.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Demonstrate safety skills in an office/work environment.</p> <p><b>B. Student Organizations</b></p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p><b>C. Technology Knowledge</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> <li>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.</li> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> <li>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</li> </ol>
6081	Cabinetmaking 2	<p><b>E. PROFESSIONAL KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> <li>13. Demonstrate customer-service skills.</li> </ul>
6082	Cabinetmaking 3	<ul style="list-style-type: none"> <li>F. Applying Wood Veneers and Plastic Laminates <ul style="list-style-type: none"> <li>1. Apply adhesives.</li> <li>2. Apply edge banding.</li> <li>3. Apply laminate to core.</li> <li>4. Apply wood edges.</li> <li>5. Cut plastic to size.</li> <li>6. Fit plastic laminate joints (plane joints).</li> <li>7. Trim edges.</li> </ul> </li> <li>G. Assembling, Fastening, and Installing Components <ul style="list-style-type: none"> <li>1. Apply clamping devices (assemble clamping devices).</li> <li>2. Assemble drawers.</li> <li>3. Assemble ends, back, bracing, and face frame.</li> <li>4. Assemble face frame.</li> <li>5. Assemble joint.</li> <li>6. Assemble panel door (assemble panels).</li> <li>7. Attach molding/trim.</li> <li>8. Fasten parts with nails.</li> <li>9. Fasten parts with screws.</li> <li>10. Fasten parts with staples.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>11. Fasten top to casework.</li> <li>12. Glue boards edge to edge.</li> <li>13. Install catches.</li> <li>14. Install doors.</li> <li>15. Install drawer rail and guides.</li> <li>16. Install hinges.</li> <li>17. Install pulls and knobs.</li> <li>18. Install shelves.</li> <li>19. Install track and slide for sliding doors.</li> <li>20. Reinforce joints with block/dowel.</li> <li>H. Cutting and Shaping Components <ul style="list-style-type: none"> <li>1. Cut butt joint.</li> <li>2. Cut counter top.</li> <li>3. Cut dado/rabbet joint.</li> <li>4. Cut doors.</li> <li>5. Cut doweled joint.</li> <li>6. Cut drawer guides and runners (rails).</li> <li>7. Cut drawer front, sides, back, and bottom.</li> <li>8. Cut ends, back, and interior bracing.</li> <li>9. Cut face frame.</li> <li>10. Cut miter joints.</li> <li>11. Cut molding/trim.</li> <li>12. Cut mortise and tenon joints.</li> <li>13. Cut out for sink.</li> <li>14. Cut frames and panels.</li> <li>15. Cut shelving.</li> <li>16. Cut spline joints.</li> <li>17. Cut tongue and groove joints.</li> <li>18. Edge (shape) counter top.</li> <li>19. Plane stock.</li> <li>20. Square solid stock.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		I. Designing and Laying Out 1. Determine materials from a blueprint. 2. Draw detailed plans. 3. Estimate labor and material cost. 4. Sketch shop plans.
6083	Cabinetmaking 4	J. Finishing Surfaces 1. Apply lacquers. 2. Apply paints. 3. Apply stains. 4. Apply varnishes/polyurethane. 5. Apply wood filler to nail or screw holes. 6. Clean surfaces. 7. Remove excess glue. 8. Sand surfaces. 9. Swell dents. K. Performing Administration Functions 1. Assemble data for bookkeeping service. 2. Charge sales to customers' accounts. 3. Conduct cash sales. 4. Demonstrate cabinet types. L. Transporting and Installing Cabinets 1. Fasten cabinet to wall. 2. Trim cabinets (fit and trim base cabinets). 3. Prepare cabinets for hauling."
<b>Carpentry</b>		
6091	Carpentry 1	A. Student Organizations 1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO). 2. Explain how CTOS are integral parts of specific clusters, majors, and/or courses. 3. Explain the benefits and responsibilities of being a member of a CTOS.

Course Code	Course Name	Essential Standards
		<p>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</p> <p>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</p> <p><b>B. Technology Knowledge</b></p> <p>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</p> <p>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</p> <p>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</p> <p>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</p> <p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p><b>NCCER® Contren Core Modules</b></p> <p><b>Module A: Safety</b></p> <p>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</p> <p>2. Describe the safe work requirements for elevated work.</p> <p>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</p> <p>4. Explain the appropriate safety precautions around common job-site hazards.</p> <p>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</p> <p>6. Identify and describe other specific job-site safety hazards.</p> <p>7. Follow safe procedures for lifting heavy objects.</p>

Course Code	Course Name	Essential Standards
		<p>8. Describe safe behavior on and around ladders and scaffolds.</p> <p>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</p> <p>10. Describe fire prevention and firefighting techniques.</p> <p>11. Define safe work procedures around electrical hazards.</p> <p>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</p> <p>13. Complete Performance Tasks</p> <p><b>Module B: Construction Math</b></p> <p>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</p> <p>2. Use a standard ruler and a metric ruler to measure.</p> <p>3. Add, subtract, multiply, and divide fractions.</p> <p>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</p> <p>5. Convert decimals to percent and percent to decimals.</p> <p>6. Convert fractions to decimals and decimals to fractions.</p> <p>7. Explain what the metric system is and how it is important in the construction trade.</p> <p>8. Recognize and use metric units of length, weight, volume, and temperature.</p> <p>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</p> <p><b>Module C: Introduction to Hand Tools</b></p> <p>1. Recognize and identify various types of basic hand tools used in the construction trade.</p> <p>2. Identify and describe how to use various types of measurement and layout tools.</p> <p>3. Identify and explain how to use various types of cutting and shaping tools.</p> <p>4. Use these tools safely.</p> <p>5. Describe the basic procedures for taking care of these tools.</p> <p>6. Complete Performance Tasks</p>

Course Code	Course Name	Essential Standards
		<p>Module E: Introduction to Construction Drawings/Recommend Blueprint Reading</p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> <li>5. Interpret and use drawing dimensions.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Employabilty Skills. Use Microburst employability skills or SkillsUSA Career Essentials for softskills. Additional Standards to be addressed will be determined by a pre-test assessment.</p>
6092	Carpentry 2	<p>F. Introduction to Carpentry</p> <ol style="list-style-type: none"> <li>1. Identify career and entrepreneurial opportunities available to people in the Carpentry trade.</li> <li>2. Identify the skills, responsibilities, and characteristics needed to be a successful carpenter.</li> <li>3. Summarize how involvement in a career-technical student organization like SkillsUSA can help a student connect to industry.</li> <li>4. Explain the importance of safety in the construction industry, and describe the obligations of the contractor, subcontractors, and you to ensure a safe work environment.</li> </ol> <p>G. Building Materials, Fasteners, and Adhesives</p> <ol style="list-style-type: none"> <li>1. State the uses of various types of hardwoods and softwoods.</li> <li>2. Describe common lumber defects.</li> <li>3. Identify the different grades of lumber and describe uses for each.</li> <li>4. Explain how treated lumber differs from nontreated lumber.</li> <li>5. Describe how plywood is manufactured and cite common applications for plywood on a construction project.</li> <li>6. Identify uses of hardboard and particleboard.</li> <li>7. Identify uses of high- and medium-density overlay plywood.</li> <li>8. Describe how oriented strand board differs from particleboard and cite common applications for OSB.</li> <li>9. Cite common applications for mineral fiberboard.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>10. State the uses of various types of engineered lumber.</p> <p>11. Identify applications for wood I-beams</p> <p>12. List advantages of glulam lumber over conventional solid lumber.</p> <p>13. Describe the composition of concrete and explain how hydration occurs.</p> <p>14. List uses of concrete masonry units for a construction project.</p> <p>15. Identify where metal framing members may be used in a structure.</p> <p>16. List general safety guidelines for working with building materials.</p> <p>17. Cite safety precautions for working with wood, concrete, and metal building materials.</p> <p>18. List basic material-handling guidelines.</p> <p>19. Describe how to handle and store wood, concrete, and store metal building materials.</p> <p>20. Calculate lumber and panel quantities.</p> <p>21. Calculate the volume of concrete required for rectangular and cylindrical shapes.</p> <p>22. Identify various types of nails and cite uses for each.</p> <p>23. Identify applications for staples.</p> <p>24. Identify various types of screws and cite uses for each.</p> <p>25. Describe uses for hammer-driven pins and studs.</p> <p>26. Identify various types of bolts, mechanical, bolt, screw, hollow-wall, anchors and cite uses for each.</p> <p>27. List the types of glues and adhesives used in construction.</p> <p>28. Demonstrate performance tasks.</p> <p><b>H. Hand and Power Tools</b></p> <p>1. Identify and describe hand tools commonly used by carpenters, e.g., levels, squares, planes, clamps, and hand saws.</p> <p>2. Identify and describe power tools commonly used by carpenters, e.g., power saws, drill presses, routers, laminate trimmers, portable power plans, and power metal shears.</p> <p>3. Describe the safe use of pneumatic and cordless nailers and staplers.</p> <p>4. Demonstrate performance tasks.</p> <p><b>I. Introduction to Construction Drawings, Specifications, and Layout</b></p> <p>1. Identify the different types of lines used on construction drawings.</p> <p>2. Identify selected architectural symbols commonly used to represent materials on plans.</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>3. Identify selected electrical, mechanical, and plumbing symbols commonly used on plans.</li> <li>4. Identify selected abbreviations commonly used on plans.</li> <li>5. Describe the methods of dimensioning construction drawings.</li> <li>6. List the various types of construction drawings and describe each.</li> <li>7. Describe how specifications are organized.</li> <li>8. Explain the importance of building codes in construction.</li> <li>9. Identify the methods of squaring a building.</li> <li>10. Demonstrate performance tasks.</li> </ol>
6093	Carpentry 3	<p>J. Floor Systems</p> <ol style="list-style-type: none"> <li>1. Explain the importance of specifications.</li> <li>2. List items commonly shown on architectural drawings.</li> <li>3. Describe information typically shown on structural drawings.</li> <li>4. Explain the importance of referencing mechanical, electrical, and plumbing plans.</li> <li>5. Describe the proper procedure for reading a set of prints.</li> <li>6. Describe the general components of a platform-framed structure.</li> <li>7. List differences between platform framing and balloon framing.</li> <li>8. Describe the characteristics of post-and-beam framing.</li> <li>9. Define sill plate and describe its role in floor framing.</li> <li>10. List and recognize different types of beams and girders and supports.</li> <li>11. List and recognize different types of floor joists and bridging.</li> <li>12. Explain the purposes of subfloor and underlayment.</li> <li>13. Describe how to check a foundation for squareness.</li> <li>14. Name the methods used to lay out and fasten sill plates to the foundation.</li> <li>15. Describe the proper procedure for installing a beam or girder.</li> <li>16. Describe how to lay out sill plates and girders for floor joists.</li> <li>17. Describe how to lay out and install floor joists for partitions and floor openings.</li> <li>18. Identify different types of bridging and describe how to properly install each type.</li> <li>19. Describe how to properly install subfloor.</li> <li>20. Explain how to install joists for projections or cantilevered floors.</li> <li>21. Describe how to estimate the amount of sill plate, sill sealer, and termite shield.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>22. Describe how to estimate the amount of beam or girder material.</p> <p>23. Describe how to estimate the amount of lumber needed for joists and joist headers.</p> <p>24. Describe how to estimate the amount of bridging required.</p> <p>25. Describe how to estimate the amount of subfloor material required.</p> <p>26. Identify some common alternative floor systems.</p> <p>27. Demonstrate performance tasks.</p> <p><b>K. Wall Systems</b></p> <p>1. Identify methods used to construct corner posts.</p> <p>2. Describe how to frame partition intersections.</p> <p>3. Explain the purpose of headers and describe how they are constructed.</p> <p>4. Describe how metal-framed walls are constructed.</p> <p>5. Describe how to properly lay out a wood frame wall.</p> <p>6. Explain how to lay out wall openings.</p> <p>7. List the steps involved in assembling a wall.</p> <p>8. Identify where fire stops are to be installed and explain how they are installed.</p> <p>9. List the four steps involved in erecting a wall.</p> <p>10. Describe wall framing techniques used in masonry construction.</p> <p>11. Explain how to estimate the amount of lumber required for soleplates and top plates.</p> <p>12. Describe how to estimate the number of studs required.</p> <p>13. Explain how to calculate the amount of material needed for a header.</p> <p>14. Describe how to estimate the amount of diagonal bracing required.</p> <p>15. Describe how concrete walls are constructed.</p> <p>16. Explain the difference between standard interior wall systems and alternative interior wall systems.</p> <p>17. State the precautions that must be taken when installing refrigerant piping.</p> <p>18. Demonstrate performance tasks.</p> <p><b>L. Ceiling and Roof Framing</b></p> <p>1. Describe the correct procedure for laying out ceiling joists.</p> <p>2. Describe how to cut and install ceiling joists on a wood frame building.</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>3. Describe how to estimate the number of ceiling joists required for a building.</li> <li>4. Identify common types of roofs used in residential construction.</li> <li>5. Identify the two types of dormers.</li> <li>6. Describe how to use a framing square and a Speed Square™ for roof framing.</li> <li>7. Explain how to lay out rafter locations.</li> <li>8. Describe how to determine the length of a common rafter.</li> <li>9. Explain the correct procedure for laying out and cutting a common rafter.</li> <li>10. Describe how to install rafters.</li> <li>11. Describe how to frame a gable overhang.</li> <li>12. Explain how to frame an opening in a roof.</li> <li>13. Identify the various types and components of trusses.</li> <li>14. Identify the basics of truss installation and bracing.</li> <li>15. Describe the basics of roof sheathing installation.</li> <li>16. Determine the materials needed for a gable roof.</li> <li>17. Demonstrate performance tasks.</li> </ol> <p>M. Building Envelope Systems</p> <ol style="list-style-type: none"> <li>1. Describe various ways that air infiltration can be minimized or prevented.</li> <li>2. Identify various types of fixed, sliding, and swinging windows.</li> <li>3. Identify the common types of exterior doors and explain how they are constructed</li> <li>4. Explain when jamb extensions are used.</li> <li>5. Identify common considerations when framing in glass blocks.</li> <li>6. Identify the differences between residential and commercial doors.</li> <li>7. Identify the various types of locksets used on exterior doors and explain how they are installed.</li> <li>8. Demonstrate performance tasks."</li> </ol>
6094	Carpentry 4	<p>N. Basic Stair Layout</p> <ol style="list-style-type: none"> <li>1. Identify how residential and commercial stairways differ.</li> <li>2. Identify the various components associated with stairs.</li> <li>3. Define headroom.</li> <li>4. Define stringer and explain when more than two stringers are used.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Define treads and risers and explain the importance of uniform tread depths and riser heights.</p> <p>6. List the minimum stairway width requirements for residential and commercial structures.</p> <p>7. Describe the difference between handrails and guards.</p> <p>8. Identify situations that carpenters may be confronted with when framing stairwells.</p> <p>9. Explain how to calculate the riser height, tread depth, and total run for a stairway.</p> <p>10. Describe how to calculate stairwell opening sizes.</p> <p>11. Explain how to lay out and cut a stringer.</p> <p>12. Describe how to properly reinforce a stringer.</p> <p>13. Summarize how concrete stairways are formed.</p> <p>14. Demonstrate performance tasks.</p> <p>H. Exterior Finishing</p> <p>1. Identify safety hazards that are present when working at elevations.</p> <p>2. Describe safety hazards when working with hand and power tools, equipment, and exterior finish materials.</p> <p>3. Identify the types of wood siding.</p> <p>4. Identify vinyl and metal siding materials and components.</p> <p>5. List applications for fiber-cement siding.</p> <p>6. Discuss the types of veneer finishes.</p> <p>7. List specialty exterior finishes.</p> <p>8. Explain the purpose of flashing.</p> <p>9. Describe surface preparation that must be performed prior to installing exterior finish materials.</p> <p>10. Discuss the types of furring and insulation that might be applied to exterior walls.</p> <p>11. Explain how to establish a straight reference line.</p> <p>12. Describe how to install wood, vinyl, metal, and fiber-cement siding.</p> <p>13. Explain how to install cornices.</p> <p>14. Explain how to perform a takeoff on panel and board siding.</p> <p>15. Demonstrate performance tasks.</p> <p>I. Thermal and Moisture Protection</p> <p>1. List the personal protective equipment (PPE) that is required when working with insulation.</p> <p>2. Describe how to safely handle insulation.</p>

Course Code	Course Name	Essential Standards
		<p>3. Explain how to determine R-value requirements.</p> <p>4. List miscellaneous types of insulation.</p> <p>5. Describe flexible, loose-fill, rigid, semi-rigid, and reflective insulation and list their characteristics.</p> <p>6. Explain how to install flexible, loose-fill, rigid, semi-rigid, and reflective insulation.</p> <p>7. List various methods to control moisture in a structure.</p> <p>8. Identify methods to waterproof a structure.</p> <p>9. Describe the estimating procedure for thermal and moisture projects.</p> <p>10. Demonstrate performance tasks.</p> <p><b>J. Roofing Applications</b>  Carpentry professionals demonstrate appropriate knowledge and skills of roofing applications as needed in their role. The following accountability criteria are considered essential for students in the Carpentry program of study.</p> <p>1. Identify potential hazards when working on roofs.</p> <p>2. Discuss the fall protection equipment required when working on roofs.</p> <p>3. Identify proper personal protective equipment (PPE) and hazard control devices used when working on roofs.</p> <p>4. Identify the hand and power tools used when working on roofing projects.</p> <p>5. Identify fasteners used on roofing projects.</p> <p>6. Identify roll-roofing applications.</p> <p>7. Identify composition, wood shakes and shingles and their applications.</p> <p>8. Explain how to install composition shingles.</p> <p>9. Explain how to install metal and roll roofing.</p> <p>10. Identify tile/slate roofing materials and their applications.</p> <p>11. Identify metal, built-up, and single-ply roofing and their applications.</p> <p>12. Explain the purpose of underlayment and waterproof membrane.</p> <p>13. Discuss the purpose of drip edge, flashing, and roof ventilation.</p> <p>14. Describe how to properly prepare a roof deck.</p> <p>15. Discuss roof projections, flashing, and ventilation.</p> <p>16. Describe the estimating procedure for roofing projects.</p>

Course Code	Course Name	Essential Standards
		<p>17. Demonstrate performance tasks.</p> <p>K. Doors and Door Hardware</p> <ol style="list-style-type: none"> <li>1. Describe the safety hazards related to working with doors.</li> <li>2. Identify the different types and composition of residential and commercial doors.</li> <li>3. Describe the uses and benefits of wood and metal door jambs and frames.</li> <li>4. Identify the different types of door hardware used in residential and commercial applications.</li> <li>5. Describe the various installation techniques for residential and commercial doors and hardware.</li> <li>6. Describe the hardware finish classifications.</li> <li>7. Describe the information included in a typical door schedule.</li> <li>8. Demonstrate performance tasks."</li> </ol>
<b>Electricity</b>		
6287	Electricity 1	<p>A. Student Organizations</p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p>B. Technology Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p>NCCER® Contren Core Modules</p> <p>Module A: Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> <li>11. Define safe work procedures around electrical hazards.</li> <li>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</li> <li>13. Complete Performance Tasks</li> </ol> <p>Module B: Construction Math</p> <ol style="list-style-type: none"> <li>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</li> <li>2. Use a standard ruler and a metric ruler to measure.</li> <li>3. Add, subtract, multiply, and divide fractions.</li> <li>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Convert decimals to percent and percent to decimals.  6. Convert fractions to decimals and decimals to fractions.  7. Explain what the metric system is and how it is important in the construction trade.  8. Recognize and use metric units of length, weight, volume, and temperature.  9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</p> <p>Module C: Introduction to Hand Tools</p> <ol style="list-style-type: none"> <li>1. Recognize and identify various types of basic hand tools used in the construction trade.</li> <li>2. Identify and describe how to use various types of measurement and layout tools.</li> <li>3. Identify and explain how to use various types of cutting and shaping tools.</li> <li>4. Use these tools safely.</li> <li>5. Describe the basic procedures for taking care of these tools.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Module E: Introduction to Construction Drawings/Recommend Blueprint Reading</p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> <li>5. Interpret and use drawing dimensions.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Employability Skills. Use Microburst employability skills or SkillsUSA Career Essentials for softskills. Additional Standards to be addressed will be determined by a pre-test assessment.</p>
6288	Electricity 2	<p>F. Orientation To Electrical Trade</p> <ol style="list-style-type: none"> <li>1. Identify various career paths and opportunities in the electrical trade.</li> <li>2. Identify the skills, responsibilities, and characteristics needed to be a successful electrician.</li> <li>3. Describe various types of training in the electrical field.</li> <li>4. List department of labor (DOL) requirements for apprenticeship.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Describe the typical components in a residential, commercial, and industrial wiring system.</p> <p>6. Identify employee and employer responsibilities.</p> <p>G. Electrical Safety</p> <ol style="list-style-type: none"> <li>1. Analyze the effects of electrical shock on the human body.</li> <li>2. Verify that circuits are de-energized.</li> <li>3. Use PPE to reduce the risk of injury.</li> <li>4. Identify OSHA requirements for protective equipment.</li> <li>5. Apply OSHA requirements in the workplace.</li> <li>6. Select and use protective equipment.</li> <li>7. Discuss the purpose of NFPA 70E®.</li> <li>8. Identify the safety hazards associated with ladders, scaffolds, and lift equipment.</li> <li>9. Avoid back injuries by practicing proper lifting techniques.</li> <li>10. Demonstrate basic tool safety.</li> <li>11. Identify confined-space entry procedures.</li> <li>12. Work safely with dangerous materials.</li> <li>13. Select and use appropriate fall protection.</li> <li>14. Demonstrate performance tasks.</li> </ol> <p>I. Introduction To Electrical Circuits</p> <ol style="list-style-type: none"> <li>1. Identify and describe hand tools commonly used by electrical workers.</li> <li>2. Identify the components of an atom.</li> <li>3. Compare the atomic structures of conductors and insulators.</li> <li>4. Identify the role of magnetism in electrical devices.</li> <li>5. Identify the basic components in a power distribution system.</li> <li>6. Define terms related to electricity, e.g., current, voltage, resistance.</li> <li>7. Use Ohm's law to solve for unknown circuit values.</li> <li>8. Identify the symbol for a resistor and determine its value based on color codes.</li> <li>9. Distinguish between series and parallel circuits.</li> <li>10. Identify the instruments used to measure circuit values.</li> <li>11. Calculate electrical power.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>12. Demonstrate performance tasks.</p> <p>J. Electrical Theory</p> <ol style="list-style-type: none"> <li>1. Identify resistances in series and parallel.</li> <li>2. Simplify series-parallel circuits.</li> <li>3. Apply Ohm's law to various types of circuits.</li> <li>4. Apply Kirchhoff's laws to various types of circuits.</li> <li>5. Use Kirchhoff's current law.</li> <li>6. Use Kirchhoff's voltage law.</li> </ol> <p>K. Introduction to National Electrical Code®</p> <ol style="list-style-type: none"> <li>1. Trace the history of the NEC®.</li> <li>2. Identify the roles of other organizations, e.g., UL, CSA.</li> <li>3. Identify the chapters in the NEC®.</li> <li>4. Use the NEC® to find specific installation requirements.</li> <li>5. Demonstrate performance tasks.</li> </ol> <p>L. Device Boxes</p> <ol style="list-style-type: none"> <li>1. Identify, size, and install boxes and their applications.</li> <li>2. Size and install pull and junction boxes.</li> <li>3. Demonstrate performance tasks.</li> </ol> <p>M. Hand Bending</p> <ol style="list-style-type: none"> <li>1. Select and use hand bending equipment.</li> <li>2. Use geometry to make a bend.</li> <li>3. Make 90° bends.</li> <li>4. Make offset bends.</li> <li>5. Cut, ream, and thread conduit.</li> <li>6. Cut conduit using a hacksaw and a pipe cutter.</li> <li>7. Cut and join PVC conduit.</li> <li>8. Demonstrate performance tasks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>N. Raceways and Fittings</p> <ol style="list-style-type: none"> <li>1. Identify types of conduit and their applications.</li> <li>2. Properly bond conduit for use as a ground path</li> <li>3. Install metal conduit fittings.</li> <li>4. Make conduit-to-box connections.</li> <li>5. Identify raceway supports.</li> <li>6. Identify installation requirements for various construction methods.</li> <li>7. Select and install tie wraps and screws.</li> <li>8. Select and install hammer-driven pins and studs.</li> <li>9. Identify the safety requirements for stud-type guns.</li> <li>10. Select and install masonry and hollow-wall anchors.</li> <li>11. Select and install epoxy anchoring systems.</li> <li>12. Identify types of wireways and their components.</li> <li>13. Install wireway supports.</li> <li>14. Identify and install specialty raceways.</li> <li>15. Identify cable tray types and fittings.</li> <li>16. Install cable tray supports.</li> <li>17. Handle and store raceways.</li> <li>18. Demonstrate performance tasks.</li> </ol> <p>O. Conductors and Cables</p> <ol style="list-style-type: none"> <li>1. Identify wire sizes.</li> <li>2. Determine conductor ampacities.</li> <li>3. Identify conductor materials and insulation.</li> <li>4. Identify fixture wiring.</li> <li>5. Identify cable types and applications.</li> <li>6. Identify instrumentation control wiring.</li> <li>7. Install conductors using fish tape.</li> <li>8. Install conductors using pulling equipment.</li> <li>9. Demonstrate performance tasks</li> </ol>

Course Code	Course Name	Essential Standards
		<p>P. Basic Electrical Construction Drawings</p> <ol style="list-style-type: none"> <li>1. Read and interpret information found on site and floor plans.</li> <li>2. Read and interpret information found elevation and sectional drawings.</li> <li>3. Read and interpret information found on title blocks.</li> <li>4. Interpret drafting lines.</li> <li>5. Use an architect's scale.</li> <li>6. Use an engineer's scale.</li> <li>7. Use a metric scale.</li> <li>8. Interpret electrical symbols.</li> <li>9. Analyze a set of electrical drawings.</li> <li>10. Identify fixtures in a lighting floor plan.</li> <li>11. Read block and schematic diagrams.</li> <li>12. Interpret written specifications.</li> <li>13. Demonstrate performance tasks.</li> </ol> <p>Q. Residential Electrical Services</p> <ol style="list-style-type: none"> <li>1. Calculate the electric service load.</li> <li>2. Apply demand factors.</li> <li>3. Calculate appliance loads.</li> <li>4. Size the load center.</li> <li>5. Size grounding electrodes and the main bonding jumper for residential electrical systems.</li> <li>6. Identify the service drop location and panelboard location of service-entrance equipment.</li> <li>7. Identify wiring methods for various types of residences.</li> <li>8. Select and install cable systems and raceways for various types of residences.</li> <li>9. Complete the branch circuit layout for power and lighting.</li> <li>10. Install outlet boxes.</li> <li>11. Select and install receptacles and switches.</li> <li>12. Install devices near residential swimming pools, spas, and hot tubs.</li> <li>13. Demonstrate performance tasks</li> </ol>

Course Code	Course Name	Essential Standards
		<p>S. Electrical Test Equipment</p> <ol style="list-style-type: none"> <li>1. Identify the applications of a voltmeter, ohmmeter, ammeter, a multimeter, and other meters.</li> <li>2. Select a meter with the correct category rating for an application.</li> <li>3. Identify electrical test equipment safety hazards.</li> <li>4. Demonstrate performance tasks.</li> </ol>
6289	Electricity 3	<p>F. Alternating Current</p> <ol style="list-style-type: none"> <li>1. Define the terminology of sine waves.</li> <li>2. Define AC phase relationships.</li> <li>3. Identify nonsinusoidal waveforms.</li> <li>4. Find unknown values in purely resistive AC circuits.</li> <li>5. Find unknown values in inductive AC circuits.</li> <li>6. Find unknown values in capacitive AC circuits.</li> <li>7. Find unknown values in combination circuits.</li> <li>8. Make power calculations in AC circuits.</li> <li>9. Calculate true, apparent, and reactive power.</li> <li>10. Use the power triangle to determine unknown values.</li> <li>11. Identify the basic components in a transformer.</li> <li>12. Identify transformer operating characteristics.</li> <li>13. Calculate turns and voltage ratios.</li> <li>14. Identify various types of transformers and their applications.</li> </ol> <p>K. Motors: Theory and Application</p> <ol style="list-style-type: none"> <li>1. Describe how DC motors operate.</li> <li>2. Identify types of DC motors.</li> <li>3. Describe how AC motors operate.</li> <li>4. Identify three-phase, synchronous, and single-phase induction motors.</li> <li>5. Identify the various types of AC and DC motors and how they operate.</li> <li>6. Identify variable-speed drives and describe their operating characteristics.</li> <li>7. Identify braking methods.</li> <li>8. Identify motor enclosures, frame designations, and operating characteristics.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>9. Identify motor operating characteristics using nameplate data.</p> <p>10. Identify the connections and terminal markings for AC motors.</p> <p>11. Identify the NEC® requirements for motors.</p> <p>12. Identify NEC® installation and motor protection requirements.</p> <p>13. Demonstrate the ability to install and wire motors.</p> <p>14. Demonstrate performance tasks.</p> <p><b>L. Electric Lighting</b></p> <p>1. Explain the relationship between human vision and light.</p> <p>2. Identify how the human eye operates.</p> <p>3. Identify the characteristics of light.</p> <p>4. Identify and install lamps.</p> <p>5. Identify and install ballasts.</p> <p>6. Identify lighting fixtures and their applications.</p> <p>7. Store and handle lamps and lighting fixtures.</p> <p>8. Install lighting fixtures.</p> <p>9. Select occupancy sensors.</p> <p>10. Select photosensors.</p> <p>11. Use lighting timers.</p> <p>12. Program energy management systems.</p> <p>13. Demonstrate performance tasks.</p> <p><b>M. Conduit Bending</b></p> <p>1. Identify the NEC® requirements for conduit bends.</p> <p>2. Identify the minimum radius requirements for various types of conduit.</p> <p>3. Calculate the number of bends per run.</p> <p>4. Use right-angle mathematics to find bend distances.</p> <p>5. Use the circumference of a circle to determine bend distances.</p> <p>6. Chart a mechanical bender.</p> <p>7. Make mechanical bends.</p> <p>8. Use electric and hydraulic conduit benders.</p>

Course Code	Course Name	Essential Standards
		<p>9. Install PVC conduit.  10. Bend PVC conduit.  11. Demonstrate performance tasks</p> <p>.</p> <p><b>N. Pull And Junction Boxes</b>  1. Select pull and junction boxes.  2. Select and install fittings.  3. Size pull and junction boxes for systems over and under 1,000V.  4. Identify conduit bodies and other cast enclosures.  5. Select and install handholes.  6. Demonstrate performance tasks.</p> <p><b>O. Conductor Installations</b>  1. Plan the installation.  2. Identify a pulling location and set up the cable reels.  3. Prepare raceways for conductors.  4. Install a pull line.  5. Prepare the cable ends for pulling.  6. Select cable-pulling equipment.  7. Set up the feeding end.  8. Support conductors.  9. Pull cable in cable trays.  10. Identify cable limitations when pulling.  11. Calculate the allowable tension on pulling devices and conductors.  12. Calculate the sidewall loading.  13. Demonstrate performance tasks.</p> <p><b>P. Cable Tray</b>  1. Select cable tray fittings.  2. Identify cable tray supports.  3. Determine the load on supports.</p>

Course Code	Course Name	Essential Standards
		<p>4. Identify types of failure under load.</p> <p>5. Identify installation requirements for cable tray.</p> <p>6. Determine the number of conductors allowed in cable tray operating at 2,000V or less.</p> <p>7. Identify de-rating factors for cable tray conductors.</p> <p>8. Demonstrate performance tasks.</p> <p>Q. Conductor Terminations and Splices</p> <p>1. Strip and train small and large conductors.</p> <p>2. Bend cable and train conductors.</p> <p>3. Make wire connections.</p> <p>4. Install various types of connectors.</p> <p>5. Make aluminum connections.</p> <p>6. Install control and signal cables.</p> <p>7. Reinsulate electrical connections.</p> <p>8. Tape electrical connections.</p> <p>9. Install heat-shrink insulators.</p> <p>10. Use motor connection kits.</p> <p>11. Demonstrate performance tasks.</p> <p>R. Grounding and Bonding</p> <p>1. Identify the purpose of grounding and bonding.</p> <p>2. Identify the grounding requirements for various systems.</p> <p>3. Identify service grounding methods.</p> <p>4. Size and install a grounding electrode conductor.</p> <p>5. Select other electrodes.</p> <p>6. Size and select equipment grounding.</p> <p>7. Size an equipment grounding conductor.</p> <p>8. Ground an enclosure.</p> <p>9. Bond service equipment.</p> <p>10. Size the main bonding jumper.</p> <p>11. Bond multiple service disconnects.</p>

Course Code	Course Name	Essential Standards
		<p>12. Bond enclosures and equipment.  13. Ground and bond separately derived systems.  14. Ground separately derived systems.  15. Install grounding at more than one building.  16. Test for effective grounds.  17. Measure earth resistance using the fall-of- potential method.  18. Complete a three-point test.  19. Demonstrate performance tasks.</p> <p>S. Circuit Breakers and Fuses  1. Identify the function of overcurrent protective devices.  2. Identify types of overcurrent conditions.  3. Identify NEC® requirements for overcurrent protective  4. Size and select circuit breakers.  5. Identify circuit breaker components.  6. Identify circuit breaker types and ratings.  7. Size and select fuses.  8. Identify fuse types and markings.  9. Size fuses.  10. Coordinate the operation of overcurrent protective devices.  11. Demonstrate performance tasks.</p> <p>T. Control Systems and Fundamental Concepts  1. Identify magnetic and mechanically held contactors.  2. Select lighting contactors.  3. Make forward and reverse motor contactor connections.  4. Select mechanically held contactors.  5. Select and troubleshoot relays.  6. Select control relays.  7. Select timers and timing relays.  8. Select solid-state relays.</p>

Course Code	Course Name	Essential Standards
		9. Select overload relays. 10. Install low-voltage remote control switching systems. 11. Identify remote control switching system components and operating characteristics. 12. Plan and install a remote control switching system. 13. Demonstrate performance tasks.
6290	Electricity 4	F. Load Calculations – Branch and Feeder Circuits 1. Calculate branch circuit ratings. 2. Apply de-rating factors. 3. Calculate branch circuit ampacity. 4. Calculate receptacle loads. 5. Calculate small appliance loads. 6. Calculate laundry circuit loads. 7. Calculate cooking appliance loads. 8. Calculate water heater loads. 9. Calculate electric heating loads. 10. Calculate air conditioning loads. 11. Calculate the loads on multi-outlet assemblies. 12. Calculate show window loads. 13. Calculate sign loads. 14. Calculate loads for heavy-duty lamp holder outlets. 15. Calculate commercial kitchen equipment loads. 16. Calculate motor loads. 17. Calculate welder loads. 18. Demonstrate performance tasks.  G. Conductor Selection and Calculations 1. Identify overcurrent protection for branch circuits and feeders. 2. Identify the properties of conductors. 3. Calculate wire sizes based on resistance. 4. Calculate conductor resistances.

Course Code	Course Name	Essential Standards
		<p>5. Calculate voltage drops for various applications.</p> <p>H. Practical Applications of Lighting</p> <ol style="list-style-type: none"> <li>1. Classify lighting by type of service and location.</li> <li>2. Identify types of lighting fixtures.</li> <li>3. Identify types of lighting for various applications.</li> <li>4. Identify special-purpose wiring systems.</li> <li>5. Select dimmer systems for various applications.</li> <li>6. Demonstrate performance tasks.</li> </ol> <p>I. Hazardous Locations</p> <ol style="list-style-type: none"> <li>1. Identify Class I locations.</li> <li>2. Identify Class II locations.</li> <li>3. Identify Class III locations.</li> <li>4. Locate NEC® requirements for hazardous locations.</li> <li>5. Identify sources of ignitions.</li> <li>6. Select and install explosion-proof equipment and seals.</li> <li>7. Demonstrate performance tasks.</li> </ol> <p>J. Overcurrent Protection</p> <ol style="list-style-type: none"> <li>a. Identify overload conditions.</li> <li>b. Identify short circuit conditions.</li> <li>c. Identify ground faults.</li> <li>d. Identify arc faults.</li> <li>e. Identify fuse ratings.</li> <li>f. Identify types of fuses and their operating characteristics.</li> <li>g. Identify fuse classes and applications.</li> <li>h. Identify circuit breaker classifications.</li> <li>i. Identify circuit breaker interrupting capacity ratings.</li> <li>j. Select overcurrent devices for various applications.</li> <li>k. Apply short circuit calculations.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>1. Test and troubleshoot circuit breakers. m. Test and troubleshoot fuses</p> <p><b>K. Distribution Equipment</b>  1. Describe switchboards and switchgear, including NEC requirements for installation, grounding, and maintenance.  2. Describe the proper installation of distribution equipment.  3. Test and maintain distribution equipment.</p> <p><b>L. Transformers</b>  1. Describe construction, operations, and applications of various transformers.  2. Describe the NEC® requirements for the installation of connections, and grounding requirements of transformers.</p> <p><b>M. Commercial Electrical Services</b>  1. Describe the components, installation considerations, and NEC® requirements for commercial electrical services.</p> <p><b>N. Motor Calculations</b>  1. Calculate conductor ampacities for a typical motor control center.  2. Calculate conductor ampacities for other motor applications.  3. Size motor protective devices.</p> <p><b>O. Motor Controls</b>  1. Identify electromechanical relays.  2. Identify magnetic contactors.  3. Identify types of motor overload protection.  4. Select NEMA magnetic contactors/motor starters.  5. Select IEC magnetic contactors/motor starters.  6. Identify contactor/motor starter accessories  8. Select motor enclosures.</p>

Course Code	Course Name	Essential Standards
		9. Interpret installation diagrams. 10. Identify NEC® regulations for motor control circuits. 11. Connect motor controllers for specific applications. 12. Demonstrate performance tasks."
<b>HVAC Technology</b>		
5330	Home System Technology 1	<p>T. Home Smart Systems</p> <p>1. Security and Surveillance</p> <p>a. Analyze the role and purpose of security and surveillance systems.</p> <p>b. Identify devices used for security and surveillance systems.</p> <p>c. Describe a UPS used for power outages.</p> <p>d. Describe the uses of video surveillance and monitoring systems.</p> <p>e. Identify the components and uses of a Wi-fi network.</p> <p>f. Describe the control and communications of security and surveillance systems.</p> <p>g. Design, install, and troubleshoot a security and surveillance system.</p> <p>2. Audio/Video</p> <p>a. Analyze the role and purpose of audio and video systems.</p> <p>b. Identify and describe the components of an audio and video system.</p> <p>c. Identify, assemble, and install cabling and connectors for an audio and video system.</p> <p>d. Describe the characteristics of analog and digital video signals.</p> <p>e. Design, install, and troubleshoot an entertainment system.</p> <p>3. Home Control Systems</p> <p>a. Analyze the role and purpose of home control systems.</p> <p>b. Identify and install devices used for environmental controls.</p> <p>c. Identify and install access controls.</p> <p>d. Identify and install lighting controls.</p> <p>e. Design, install, and troubleshoot a home control system.</p> <p>4. Telecommunications</p>

Course Code	Course Name	Essential Standards
		a. Analyze the role and purpose of phone and VoIP systems. b. Identify and install devices used for phone and VoIP systems. c. Design, install, and troubleshoot a telecommunications system. Microburst employABILITY skills or SkillsUSA Career Essentials for soft skills. Additional Standards to be addressed will be determined by a pre-test assessment."
6003	HVAC Technology 1	<b>A. STUDENT ORGANIZATIONS</b> 1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO). 2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses. 3. Explain the benefits and responsibilities of being a member of a CTSO. 4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities. 5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations. <b>B. TECHNOLOGY KNOWLEDGE</b> 1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation. 2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes. 3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks. 4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment). 5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use. 6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information. 7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.

Course Code	Course Name	Essential Standards
		<p>D. PROFESSIONAL KNOWLEDGE</p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> <li>13. Demonstrate customer-service skills.</li> </ol> <p>NCCER® Contren Core Modules</p> <p>Module A: Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> <li>11. Define safe work procedures around electrical hazards.</li> <li>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</li> </ol>

Course Code	Course Name	Essential Standards
		<p>13. Complete Performance Tasks</p> <p>Module B: Construction Math</p> <ol style="list-style-type: none"> <li>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</li> <li>2. Use a standard ruler and a metric ruler to measure.</li> <li>3. Add, subtract, multiply, and divide fractions.</li> <li>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</li> <li>5. Convert decimals to percent and percent to decimals.</li> <li>6. Convert fractions to decimals and decimals to fractions.</li> <li>7. Explain what the metric system is and how it is important in the construction trade.</li> <li>8. Recognize and use metric units of length, weight, volume, and temperature.</li> <li>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</li> </ol> <p>Module C: Introduction to Hand Tools</p> <ol style="list-style-type: none"> <li>1. Recognize and identify various types of basic hand tools used in the construction trade.</li> <li>2. Identify and describe how to use various types of measurement and layout tools.</li> <li>3. Identify and explain how to use various types of cutting and shaping tools.</li> <li>4. Use these tools safely.</li> <li>5. Describe the basic procedures for taking care of these tools.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Module E: Introduction to Construction Drawings/Recommend Blueprint Reading</p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> <li>5. Interpret and use drawing dimensions.</li> <li>6. Complete Performance Tasks</li> </ol>

Course Code	Course Name	Essential Standards
		<p>Employability Skills. Use Microburst EmployABILITY skills or SkillsUSA Career Essentials for softskills. Additional Standards to be addressed will be determined by a pre-test assessment.</p> <p><b>F. Introduction to HVACR</b>  HVACR professionals demonstrate knowledge of the HVACR industry and relevant professional development as needed in their role. The following accountability criteria are considered essential for students in the HVACR program of study.</p> <ol style="list-style-type: none"> <li>1. Explain the basic principles of heating, ventilation, and air conditioning.</li> <li>2. Identify career opportunities available to people in the HVACR trade.</li> <li>3. Explain the purpose and objectives of an apprentice training program.</li> <li>4. Describe how certified apprentice training can start in high school.</li> <li>5. Describe what the Clean Air Act means to the HVACR trade.</li> </ol> <p><b>G. Trade Mathematics (OPTIONAL)</b></p> <ol style="list-style-type: none"> <li>1. Identify similar units of measurement in both the inch-pound (English) and metric systems and know which units are larger.</li> <li>2. Convert measured values in the inch-pound system to equivalent metric values and vice versa.</li> <li>3. Express numbers as powers of ten.</li> <li>4. Determine the powers and roots of numbers.</li> <li>5. Solve basic algebraic equations.</li> <li>6. Recognize various geometric figures.</li> <li>7. Use the Pythagorean Theorem to make calculations involving right triangles.</li> <li>8. Convert decimal feet to feet and inches and vice versa.</li> </ol> <p><b>H. Basic Electricity</b></p> <ol style="list-style-type: none"> <li>1. State how electrical power is generated and distributed.</li> <li>2. Describe how the voltage, current, resistance, and power are related.</li> <li>3. Use Ohm's law to calculate the current, voltage, and resistance in a circuit.</li> <li>4. Use the power formula to calculate how much power is consumed by a circuit.</li> <li>5. Describe the differences between series and parallel.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>6. Recognize and describe the purpose and operation of the various electrical components used in HVACR equipment.</p> <p>7. State and demonstrate the safety precautions that must be followed when working on electrical equipment.</p> <p>8. Make voltage, current, and resistance measurements using electrical test equipment.</p> <p>9. Wire a relay.</p> <p>10. Wire a contactor and/or starter.</p> <p>11. Demonstrate performance tasks.</p> <p>I. Introduction To Heating</p> <p>Explain the three methods by which heat is transferred and give an example of each.</p> <p>2. Describe how combustion occurs and identify the byproducts of combustion.</p> <p>3. Identify the various types of fuels used in heating.</p> <p>4. Identify the major components and accessories of a forced-air furnace and explain the function of each component.</p> <p>5. State the factors that must be considered when installing a furnace.</p> <p>6. Identify the major components of a gas furnace and describe how each works.</p> <p>7. With supervision, use a manometer to measure and adjust manifold pressure on a gas furnace.</p> <p>8. Identify the major components of an oil furnace and describe how each works.</p> <p>9. Describe how an electric furnace works.</p> <p>10. With supervision, perform basic furnace preventative maintenance procedures such as cleaning and filter replacement.</p> <p>11. Demonstrate performance tasks."</p>
6004	HVAC Technology 2	<p>J. Introduction To Cooling</p> <p>1. Explain how heat transfer occurs in a cooling system, demonstrating an understanding of the terms and concepts used in the refrigeration cycle.</p> <p>2. Calculate the temperature and pressure relationships at key points in the refrigeration cycle.</p> <p>3. Under supervision, use temperature- and pressure-measuring instruments to make readings at key points in the refrigeration cycle.</p>

Course Code	Course Name	Essential Standards
		<p>4. Identify commonly used refrigerants and demonstrate the procedures for handling these refrigerants.</p> <p>5. Identify and draw the major components of a cooling system and explain how each type works.</p> <p>6. Identify the major accessories available for cooling systems and explain how each type works.</p> <p>7. Identify the control devices used in cooling systems and explain how each type works.</p> <p>8. State the correct methods to be used when piping a refrigeration or cooling systems.</p> <p>9. Front Seat, mid position, and back service valve.</p> <p>10. Install filter dryer.</p> <p>11. Install capillary tube.</p> <p>12. Install liquid line indicator.</p> <p>13. Install an access core types service valve.</p> <p>14. Demonstrate performance tasks.</p> <p><b>K. Introduction to Air Distribution Systems</b></p> <p>1. Describe the airflow and pressures in a basic forced-air distribution systems.</p> <p>2. Explain the differences between propeller and centrifugal fans and blowers.</p> <p>3. Identify the various types of duct systems and explain why and where each type is used.</p> <p>4. Demonstrate or explain the installation of metal, fiberboard, and flexible duct.</p> <p>5. Demonstrate or explain the installation of fittings and transitions used in duct systems.</p> <p>6. Demonstrate or explain the use and installation of diffusers, registers, and grilles used in duct systems.</p> <p>7. Demonstrate or explain the use and installation of dampers used in duct systems.</p> <p>8. Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.</p> <p>9. Identify the instruments used to make measurements in air systems and explain the use of each instrument.</p> <p>10. Make basic temperature, air pressure, and velocity measurements in an air distribution systems.</p> <p>11. Demonstrate performance tasks.</p>

Course Code	Course Name	Essential Standards
		<p>L. Basic Copper and Plastic Piping Practices</p> <ol style="list-style-type: none"> <li>1. State the precautions that must be taken when installing refrigerant piping.</li> <li>2. Select the right tubing for the job.</li> <li>3. Cut and bend tubing.</li> <li>4. Safely join tubing by using flare and compression fittings.</li> <li>5. Determine the kinds of hangers and supports needed for refrigerant piping.</li> <li>6. State the basic requirements for pressure-testing a system once it has been installed.</li> <li>7. Demonstrate performance tasks.</li> </ol> <p>M. Soldering And Brazing</p> <ol style="list-style-type: none"> <li>1. Assemble and operate the tools used for soldering.</li> <li>2. Prepare tubing and fittings for soldering.</li> <li>3. Identify the purposes and uses of solder and solder fluxes.</li> <li>4. Solder copper/brass/steel tubing and fittings.</li> <li>5. Assemble and operate the tools used for brazing.</li> <li>6. Prepare tubing and fittings for brazing.</li> <li>7. Identify the purposes and uses of filler metals and fluxes used for brazing.</li> <li>8. Brace copper tubing and fittings.</li> <li>9. Identify the inert gases that can safely be used to purge tubing when brazing.</li> <li>10. Construct a swage joint.</li> <li>11. Braze saddle valve on suction line.</li> <li>12. Demonstrate performance tasks.</li> </ol> <p>N. Basic Carbon Steel Piping Practices</p> <ol style="list-style-type: none"> <li>1. Identify the types of ferrous metal pipes.</li> <li>2. Measure the sizes of ferrous metal pipes.</li> <li>3. Identify the common malleable iron fittings.</li> <li>4. Cut, ream, and thread ferrous metal pipe.</li> <li>5. Join lengths of threaded pipe together and install fittings.</li> <li>6. Describe the main points to consider when installing pipe runs.</li> <li>7. Describe the method used to join grooved piping.</li> </ol>

Course Code	Course Name	Essential Standards
		8. Demonstrate performance tasks.
6005	HVAC Technology 3	<p>F. Alternating Current</p> <ol style="list-style-type: none"> <li>1. Describe the operation of various types of transformers.</li> <li>2. Explain how alternating current is developed and draw a sine wave.</li> <li>3. Identify shingle-phase and three-phase writing arrangements.</li> <li>4. Explain how phase shift occurs in inductors and capacitors.</li> <li>5. Describe the types of capacitors and their applications.</li> <li>6. Explain the operation of single-phase and three-phase induction motors.</li> <li>7. Identify the various types of single-phase motors and their applications.</li> <li>8. Use a wattmeter, megger, capacitor analyzer, and chart recorder.</li> <li>9. Test inductors and capacitors using an ohmmeter.</li> <li>10. State and demonstrate the safety precautions that must be followed when working with electrical equipment.</li> <li>11. Demonstrate performance tasks.</li> </ol> <p>G. Compressors</p> <ol style="list-style-type: none"> <li>1. Identify the different kinds of compressors.</li> <li>2. Demonstrate or describe the mechanical operation for each type of compressor.</li> <li>3. Demonstrate or explain compressor lubrication methods.</li> <li>4. Demonstrate or explain methods used to control compressor capacity.</li> <li>5. Demonstrate describe how compressor protection devices operate.</li> <li>6. Perform the common procedures used when field servicing open and semi-hermetic compressors, i.e., valve plat removal and installation, and unloader adjustment.</li> <li>7. Demonstrate the procedures used to identify system problems that cause compressor failures.</li> <li>8. Demonstrate the system checkout procedure performed following a compressor failure.</li> <li>9. Demonstrate or describe the procedures used to remove and install a compressor.</li> <li>10. Demonstrate or describe the procedures used to clean up a system after a compressor burnout.</li> <li>11. Install a start capacitor with different types of relays.</li> <li>12. Demonstrate performance tasks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>H. Refrigerants and Oils</p> <ol style="list-style-type: none"> <li>1. Describe the desirable characteristics of refrigerants and the various applications that require these characteristics.</li> <li>2. Identify the primary chemical classifications of common refrigerants.</li> <li>3. Describe the environmental concerns associated with refrigerants.</li> <li>4. Identify and describe compounded and blended azeotrope, near-azeotropic, and zeotropic refrigerants.</li> <li>5. Identify various refrigerant classifications and cylinder colors.</li> <li>6. Explain how to use pressure-temperature (PT) charts to calculate superheat and subcooling for compounds, azeotropic, and near-azeotropic, and zeotropic refrigerants.</li> <li>7. Identify important characteristics of refrigerant oils.</li> <li>8. Compare mineral-based and synthetic oils.</li> <li>9. Describe the movement of oil through the refrigerant circuit.</li> <li>10. Describe oil contamination and its sources.</li> <li>11. Describe common practices associated with handling, charging, and removing oils.</li> <li>12. Identify and describe issues of concern and common practices related to refrigerant conversions.</li> <li>13. Demonstrate performance tasks.</li> </ol> <p>I. Leak Detection, Evacuation, Recovery, and Charging</p> <ol style="list-style-type: none"> <li>1. Identify the common types of leak detectors and explain how each is used.</li> <li>2. Demonstrate skill in performing leak detection tests.</li> <li>3. Identify the service equipment used for evacuating a system and explain why each item of equipment is used.</li> <li>4. Demonstrate skill in performing system evacuation and dehydration.</li> <li>5. Identify the service equipment used for recovering refrigerant from a system and for recycling the recovered refrigerant, and explain why each item of equipment is used.</li> <li>6. Demonstrate skill in performing refrigerant recovery.</li> <li>7. Demonstrate or explain how to use a recycle unit.</li> <li>8. Identify the service equipment used for charging.</li> <li>9. Demonstrate performance tasks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>J. Metering Devices</p> <ol style="list-style-type: none"> <li>1. Explain the function of metering devices.</li> <li>2. Describe the operation of selected metering devices and expansion valves.</li> <li>3. Identify types of thermal expansion valves (TXVs).</li> <li>4. Describe the procedure for installing and adjusting selected TXVs.</li> <li>5. Demonstrate performance tasks.</li> </ol> <p>K. Heat Pumps</p> <ol style="list-style-type: none"> <li>1. Describe the principles of reverse-cycle heating.</li> <li>2. Identify heat pumps by type and general classification.</li> <li>3. List the components of heat pump systems.</li> <li>4. Demonstrate heat pump installation and service procedures.</li> <li>5. Identify and install refrigerant circuit accessories commonly associated with heat pumps.</li> <li>6. Analyze a heat pump control circuit.</li> <li>7. Demonstrate performance tasks.</li> </ol>
6006	HVAC Technology 4	<p>L. Basic Maintenance</p> <ol style="list-style-type: none"> <li>1. Identify the types of gaskets, pickings, and seals and explain their use.</li> <li>2. Remove and install gaskets, packings, and seals.</li> <li>3. Identify the types of lubricants and explain their use.</li> <li>4. Use lubrication equipment to lubricate motor bearings.</li> <li>5. Identify the types of belt drives and explain their use.</li> <li>6. Demonstrate and/or explain procedures used to install or adjust a belt drive.</li> <li>7. Identify the types of couplings and explain their use.</li> <li>8. Demonstrate and/or explain procedures used to remove, install, and align couplings.</li> <li>9. Identify the types of bearings and explain their use.</li> <li>10. Explain causes of bearing failures.</li> <li>11. Demonstrate and/or explain procedures used to remove and install bearings.</li> <li>12. Perform basic preventive maintenance inspection and cleaning procedures.</li> <li>13. Identify common environmental health hazards associated with HVACR maintenance activities.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>14. Describe common inspection and maintenance procedures for gas heating equipment.</p> <p>15. Describe common inspection and maintenance procedures for DX cooling and heat pump systems.</p> <p>16. Describe common inspection and maintenance procedures for various system accessories.</p> <p>17. Describe how to complete common HVACR service reports.</p> <p>18. Demonstrate performance tasks.</p> <p><b>M. Chimneys, Vents, and Flues</b></p> <p>1. Describe the principles of combustion and explain complete and incomplete combustion.</p> <p>2. Describe the content of flue gas and explain how it is vented.</p> <p>3. Identify the components of a furnace vent system.</p> <p>4. Describe how to select and install a vent system.</p> <p>5. Perform the adjustments necessary to achieve proper combustion in a gas furnace.</p> <p>6. Describe the techniques for venting different types of furnaces.</p> <p>7. Explain the various draft control devices used with natural-draft furnaces.</p> <p>8. Demonstrate performance tasks.</p> <p><b>N. Sheet Metal Duct Systems</b></p> <p>1. Identify various types of steel sheet metals.</p> <p>2. Identify various types of allow sheet metals.</p> <p>3. Identify various types of duct seams.</p> <p>4. Identify various methods of duct component connection.</p> <p>5. Describe methods used to suspend sheet metal duct.</p> <p>6. Describe methods used to support sheet metal duct.</p> <p>7. Describe the selection and installation of duct lining products.</p> <p>8. Describe the selection and installation of external duct wraps.</p> <p>9. Identify and describe the installation of various types of dampers.</p> <p>10. Identify and describe the installation of duct takeoffs and access doors.</p> <p>11. Identify different types of flexible duct.</p> <p>12. Explain how flexible duct is connected and supported.</p> <p>13. Demonstrate performance tasks.</p>

Course Code	Course Name	Essential Standards
		<p>O. Fiberglass And Flexible Duct Systems</p> <ol style="list-style-type: none"> <li>1. Identify the standards related to fiberglass duct.</li> <li>2. Identify application considerations related to fiberglass duct.</li> <li>3. Describe how to close and join fiberglass duct using various methods.</li> <li>4. Describe how to repair both minor and major fiberglass duct damage.</li> <li>5. Describe methods used to suspend and support fiberglass duct.</li> <li>6. Describe methods used to suspend and support fiberglass duct fittings and risers.</li> <li>7. Identify various types and designs of fabric-based air distribution products.</li> <li>8. Describe the various methods of installing and suspending fabric-based air distribution products.</li> <li>9. Demonstrate performance tasks.</li> </ol> <p>P. Commercial Airside Systems</p> <ol style="list-style-type: none"> <li>1. Describe the typical operating characteristics of a commercial airside system.</li> <li>2. Describe the purpose and function of ventilation and exhaust systems.</li> <li>3. Describe single-zone constant volume system operation.</li> <li>4. Describe multi-zone constant volume system operation.</li> <li>5. Describe variable volume, variable temperature (VVT) system operation.</li> <li>6. Describe variable air volume (VAV) system operation.</li> <li>7. Explain the basic operation of VVT and single-duct VAV terminal devices.</li> <li>8. Explain the basic operation of fan-powered VAV terminals.</li> <li>9. Identify various styles of commercial grilles and registers.</li> <li>10. Describe the various forms and components of packaged systems.</li> <li>11. Describe the various forms and components of air handling units.</li> <li>12. Describe common accessories used with commercial airside systems.</li> <li>13. Demonstrate performance tasks.</li> </ol> <p>Q. Air Quality Equipment</p> <ol style="list-style-type: none"> <li>1. Identify the factors related to the quality of indoor air.</li> <li>2. Describe the elements of human comfort and their relationship to air properties.</li> <li>3. Explain the relationship between air and moisture content.</li> </ol>

Course Code	Course Name	Essential Standards
		4. Describe the processes and equipment used to humidify and dehumidify air. 5. Identify the various types of media-based air filters. 6. Describe the operation of non-media based air filtration and purification equipment. 7. Explain how dampers and economizers are used to control the introduction of fresh air. 8. Describe the function and operation of energy and heat recovery ventilation systems. 9. Demonstrate performance tasks."
<b>Masonry</b>		
6250	Masonry 1	<p>A. Student Organizations</p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p>B. Technology Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> <li>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</li> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p>D. Professional Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> <li>13. Demonstrate customer-service skills.</li> </ol> <p>NCCER® Contren Core Modules</p> <p>Module A: Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>11. Define safe work procedures around electrical hazards.  12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)  13. Complete Performance Tasks</p> <p><b>Module B: Construction Math</b></p> <ol style="list-style-type: none"> <li>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</li> <li>2. Use a standard ruler and a metric ruler to measure.</li> <li>3. Add, subtract, multiply, and divide fractions.</li> <li>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</li> <li>5. Convert decimals to percent and percent to decimals.</li> <li>6. Convert fractions to decimals and decimals to fractions.</li> <li>7. Explain what the metric system is and how it is important in the construction trade.</li> <li>8. Recognize and use metric units of length, weight, volume, and temperature.</li> <li>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</li> </ol> <p><b>Module C: Introduction to Hand Tools</b></p> <ol style="list-style-type: none"> <li>1. Recognize and identify various types of basic hand tools used in the construction trade.</li> <li>2. Identify and describe how to use various types of measurement and layout tools.</li> <li>3. Identify and explain how to use various types of cutting and shaping tools.</li> <li>4. Use these tools safely.</li> <li>5. Describe the basic procedures for taking care of these tools.</li> <li>6. Complete Performance Tasks</li> </ol> <p><b>Module E: Introduction to Construction Drawings/Recommend Blueprint Reading</b></p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> </ol>

Course Code	Course Name	Essential Standards
		5. Interpret and use drawing dimensions. 6. Complete Performance Tasks Employability Skills. Use Microburst EmployABILITY skills or SkillsUSA Career Essentials for soft skills. Additional Standards to be addressed will be determined by a pre-test assessment."
6251	Masonry 2	F. Introduction to Masonry 1. Explore career ladders and advancement possibilities in masonry. 2. Identify the skills, attitudes, and abilities needed to be a successful mason. 3. Describe various types of training in the masonry industry. 4. List department of labor (DOL) requirements for apprenticeship. 5. Describe modern masonry materials and techniques. 6. Explain how concrete masonry units (CMUs or block) are used in construction. 7. Explain how clay masonry units (brick) are used in construction. 8. Explain how stone is used in construction. 9. Describe how mortar and grout are used in masonry construction. 10. Describe how wall structures are created using masonry units. 11. Identify the basic safety precautions when working with masonry materials. 12. Explain how to mix mortar and lay masonry units. 13. Demonstrate performance tasks.  G. Masonry Safety 1. Identify the causes and costs of job accidents. 2. Identify hazards. 3. Demonstrate proper housekeeping techniques. 4. Observe mortar and concrete safety. 5. Observe flammable liquid safety. 6. Identify the proper use of personal protective equipment in masonry. 7. Describe how to use protective lenses and face shields. 8. Describe how to use hearing protection. 9. Describe how to use gloves and respirators. 10. Work safely from elevated surfaces.

Course Code	Course Name	Essential Standards
		<p>11. Explain fall protection procedures.</p> <p>12. Describe personal fall arrest systems.</p> <p>13. List basic scaffold safety guidelines.</p> <p>14. Explain how to protect against falling objects.</p> <p>15. Use tools and equipment safely.</p> <p>16. Describe how to use hand tools, saws, mixers, and grinders safely.</p> <p>17. Describe how to work safely around forklifts.</p> <p>18. List basic electrical safety guidelines.</p> <p>19. Describe how to use powder-actuated tools safely.</p> <p>20. Handle materials properly.</p> <p>21. Store and stockpile masonry materials.</p> <p>22. Stack brick.</p> <p>23. Demonstrate performance tasks.</p> <p><b>H. Masonry Tools and Equipment</b></p> <p>1. Identify hand tools used in masonry.</p> <p>2. Describe how to use trowels, hammers, chisels, jointers, and brushes.</p> <p>3. Describe how to use other masonry tools.</p> <p>4. Identify measures and measuring tools used in masonry.</p> <p>5. Describe how to use rules and levels.</p> <p>6. Describe how to use chalk boxes, squares, plumb bobs, and laser levels.</p> <p>7. Describe how to use corner poles, lines, and fasteners.</p> <p>8. Identify mortar equipment used in masonry.</p> <p>9. Describe how to use mortar boxes.</p> <p>10. Describe how to use mixing accessories.</p> <p>11. Identify power tools used in masonry.</p> <p>12. Describe how to use masonry saws, splitters, and grinders.</p> <p>13. Describe how to use power drills and powder-actuated tools.</p> <p>14. Identify power equipment used in masonry.</p> <p>15. Describe how to use a mortar mixer.</p> <p>16. Describe how to use a masonry pump, vibrator, and hydraulic grout placer.</p>

Course Code	Course Name	Essential Standards
		<p>17. Describe how to use pressurized cleaning equipment.</p> <p>18. Identify lifting equipment used in masonry.</p> <p>19. Describe how to use mounted and portable hoists.</p> <p>20. Describe how to use hydraulic-lift materials trucks.</p> <p>21. Describe how to use forklifts and pallet jacks.</p> <p>22. Identify the types of scaffolds used in masonry.</p> <p>23. Assemble and disassemble tubular frame scaffold.</p> <p>24. Demonstrate performance tasks.</p> <p>I. Measurements, Drawings, and Specifications</p> <p>1. Explain how to read a six-foot rule.</p> <p>2. Explain how to read other measuring devices.</p> <p>3. Explain how to read mason's rules.</p> <p>4. Identify modular increments.</p> <p>5. Describe how to determine areas and circumferences.</p> <p>6. Explain how to use the 3-4-5 ratio to square a corner.</p> <p>7. Identify lines, symbols, and abbreviations used on drawings.</p> <p>8. Identify scales and dimensions used on drawings.</p> <p>9. Identify types of construction drawings.</p> <p>10. Explain the purpose of specifications, standards, and codes.</p> <p>11. Describe the purpose of inspections and testing.</p> <p>12. Demonstrate performance tasks.</p> <p>J. Mortar</p> <p>1. Describe the use of portland cement, hydrated lime, and sand.</p> <p>2. Describe masonry cement.</p> <p>3. Describe pre-blended mortars.</p> <p>4. Describe the use of water and admixtures.</p> <p>5. Describe the types of masonry mortar.</p> <p>6. Describe properties of plastic and hardened mortar.</p> <p>7. Describe the effects of improper proportioning and poor-quality materials.</p>

Course Code	Course Name	Essential Standards
		<p>8. Explain the effects of extreme weather and tempering.  9. Describe efflorescence.  10. Describe how to set up and maintain the mixing area.  11. Describe how to mix mortar by hand and with a power mixer.  12. Demonstrate performance tasks.</p> <p>K. Masonry Units and Installation Techniques  1. Identify the characteristics of concrete masonry units.  2. Explain how to set up, lay out, and bond concrete masonry units.  3. Explain how to lay and tool concrete masonry units.  4. Explain how to clean concrete masonry units.  5. Identify the characteristics of brick.  6. Explain how to set up, lay out, and bond brick.  7. Explain how to lay and tool brick.  8. Explain how to clean brick.  9. Explain how to cut with chisels and masonry hammers.  10. Explain how to cut with saws and splitters.  11. Explain how to check units and cuts.  12. Describe how to install masonry reinforcements.  13. Describe how to install masonry accessories.  14. Demonstrate performance tasks."</p>
6252	Masonry 3	<p>F. Residential Plans and Drawing Interpretation  1. Identify keys and legends, as well as selected lines, architectural terms, abbreviations, and symbols on residential drawings.  2. Explain how to use scales and dimensions in residential drawings.  3. Explain how to interpret the various types of residential drawings.  4. Explain how to use the rule-of-thumb method.  5. Explain how to use estimating aids.  6. Demonstrate performance tasks.</p>

Course Code	Course Name	Essential Standards
		<p>G. Residential Masonry</p> <ol style="list-style-type: none"> <li>1. Explain what spread foundations are.</li> <li>2. Explain what raft and mat foundations are.</li> <li>3. Explain what foundation walls are.</li> <li>4. Describe the various types of clay brick pavers.</li> <li>5. Explain how to install clay brick pavers.</li> <li>6. Describe the various types of concrete and interlocking pavers.</li> <li>7. Explain how to install concrete and interlocking pavers.</li> <li>8. Describe the various types of steps.</li> <li>9. Explain how to recognize patterns and tread designs.</li> <li>10. Explain how to build a concrete base.</li> <li>11. Explain how to set clay brick in steps.</li> <li>12. Explain how patios and decks are constructed.</li> <li>13. Explain the basic theory of the fireplace.</li> <li>14. Describe the parts of a fireplace.</li> <li>15. Explain the key points of workmanship.</li> <li>16. Explain how to lay out chimneys and fireplaces.</li> <li>17. Explain how to begin the fireplace.</li> <li>18. Explain how to finish the fireplace.</li> <li>19. Describe a multi-opening fireplace.</li> <li>20. Demonstrate performance tasks.</li> </ol> <p>H. Reinforced Masonry</p> <ol style="list-style-type: none"> <li>1. Explain the characteristics of coarse and fine aggregates.</li> <li>2. Explain the characteristics of admixtures.</li> <li>3. Explain the role of water content in grout.</li> <li>4. Explain why compressive strength is important.</li> <li>5. Explain what mix specifications are and why they are important.</li> <li>6. Explain the procedures for mixing grout.</li> <li>7. Explain what low- and high-lift grouting is and how to place grout using this technique.</li> <li>8. Explain why mortaring of joints for grouted masonry is important.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>9. Explain how to use mechanical vibrators with grout.</p> <p>10. Explain how to cut and bend rebar.</p> <p>11. Explain how to place rebar in reinforced walls.</p> <p>12. Explain how to install bond beams and bond beam lintels.</p> <p>13. Explain how to install precast lintels.</p> <p>14. Explain how to install piers, pilasters, and columns.</p> <p>15. Demonstrate performance tasks.</p> <p>I. Masonry Openings and Metal Work</p> <p>1. Describe how to use and install door and window frames, windowsills, steel lintels, chases, and recesses.</p> <p>2. Describe how to use and install ladder and truss joint reinforcement.</p> <p>3. Describe how to use and install seismic reinforcements.</p> <p>4. Describe how to use and install flexible and horizontal anchors.</p> <p>5. Describe how to use and install rigid ties and bolts, bearing plates, saddles, and strap ties.</p> <p>6. Demonstrate performance tasks.</p> <p>J. Advanced Laying Techniques</p> <p>1. Identify the structural principles and fundamental uses of different types of wall make-ups, e.g., solid, hollow, cavity, composite, etc.</p> <p>2. Identify the uses of control and expansion joints.</p> <p>3. Lay out and construct various corners and intersections.</p> <p>4. Lay out and construct tothing, corbeling, intersecting walls, and angled corners.</p> <p>5. Demonstrate performance tasks.</p> <p>K. Effects of Climate on Masonry</p> <p>1. Explain the concept of heat transfer.</p> <p>2. Explain the purpose of and installation procedures for internal and external insulation.</p> <p>3. Explain the purpose of and installation procedures for flashing, weep vents, and waterproofing.</p> <p>4. Explain the role played by weather data and information in masonry construction.</p>

Course Code	Course Name	Essential Standards
		5. Explain the various techniques used to provide adequate protection during hot- and cold weather masonry construction. 6. Demonstrate performance tasks.
6253	Masonry 4	<p>F. Construction Inspection And Quality Control</p> <ol style="list-style-type: none"> <li>1. Describe the standards and specifications that apply to masonry units, mortar, grout, and accessories.</li> <li>2. Describe the standards that apply to laboratory and field testing of masonry construction.</li> <li>3. Describe how to build sample panels.</li> <li>4. Describe how to build hollow and grouted masonry prisms.</li> <li>5. Describe how to prepare and test mortar and grout prisms.</li> <li>6. Describe how to conduct masonry tests.</li> <li>7. Describe how to perform sand tests.</li> <li>8. Describe how to perform mortar consistency tests.</li> <li>9. Describe how to perform brick absorption tests.</li> <li>10. Describe how to perform laboratory tests.</li> <li>11. Describe why and how standards and codes inspections are performed.</li> <li>12. Describe why and how materials inspections are performed.</li> <li>13. Describe the types of observations that are undertaken during construction.</li> <li>14. Describe why and how construction tolerances are monitored.</li> <li>15. Demonstrate performance tasks.</li> </ol> <p>G. Elevated Masonry</p> <ol style="list-style-type: none"> <li>1. Describe safety precautions related to an elevated work area.</li> <li>2. Discuss fall protection related to elevated work areas.</li> <li>3. Describe how to properly brace a concrete masonry wall for wind.</li> <li>4. Describe how to properly brace a wall for backfill.</li> <li>5. List the construction sequence for elevated masonry systems.</li> <li>6. Describe how elevated masonry systems are designed.</li> <li>7. Identify common interior and exterior walls used for elevated masonry systems.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>8. Explain safety precautions and proper hand signals to be observed when working around cranes and material hoists.</p> <p>9. Explain safety precautions to be observed when moving and stocking materials.</p> <p>10. Explain safety precautions to be observed when working at elevated workstations.</p> <p>11. Explain how disposal chutes and waste bins are used when working from elevated workstations.</p> <p>12. Demonstrate performance tasks.</p> <p>H. Estimating</p> <p>1. Describe how to use the coursing method for block.</p> <p>2. Describe the square-foot method for block.</p> <p>3. Explain how to estimate openings and lintels.</p> <p>4. Explain how to estimate mortar for single- and multi-wythe walls.</p> <p>5. Explain how to estimate grout.</p> <p>6. Explain the coursing method for brick.</p> <p>7. Explain the square-foot method for brick.</p> <p>8. Describe how to allow for openings in an estimate.</p> <p>9. Explain how to estimate mortar for brick.</p> <p>10. Explain how to estimate joint reinforcement.</p> <p>11. Explain how to estimate structural reinforcement.</p> <p>12. Explain how to estimate masonry ties.</p> <p>13. Explain how to estimate other masonry units.</p> <p>14. Explain how to estimate other masonry accessories.</p> <p>15. Demonstrate performance tasks.</p> <p>I. Site Layout – Distance Measurement and Leveling</p> <p>1. List characteristics of contour lines.</p> <p>2. Describe layout control points.</p> <p>3. Explain how to convert between distance-measurement systems.</p> <p>4. Explain how to place control points and other markers.</p> <p>5. Describe how to communicate information on control points and other markers.</p>

Course Code	Course Name	Essential Standards
		<p>6. Discuss how control markers are color coded.</p> <p>7. Explain how to use tapes.</p> <p>8. Explain how to use range poles.</p> <p>9. Explain how to use plumb bobs and gammon reels.</p> <p>10. Explain how to use hand sight levels.</p> <p>11. Explain how to estimate distances by pacing.</p> <p>12. Describe how to measure distances electronically.</p> <p>13. Identify leveling instruments.</p> <p>14. Describe the use of tripods and leveling rods.</p> <p>15. Explain how to set up and adjust leveling instruments.</p> <p>16. Explain how to test the calibration of leveling instruments.</p> <p>17. Define differential-leveling terminology.</p> <p>18. Explain the differential-leveling procedure.</p> <p>19. Explain how field notes are recorded and used.</p> <p>20. Explain how to transfer elevations up a structure.</p> <p>21. Explain profile, cross-section, and grid leveling.</p> <p>22. Explain how to construct batter boards.</p> <p>23. Describe how to use the 3-4-5 rule.</p> <p>24. Demonstrate performance tasks</p> <p>.</p> <p>J. Fundamentals of Crew Leadership</p> <p>1. Describe the opportunities in the masonry industries.</p> <p>2. Describe how workers' values change over time.</p> <p>3. Explain the importance of training and safety for the leaders in the masonry industries.</p> <p>4. Describe how new technologies are beneficial to the masonry industries.</p> <p>5. Identify the gender and minority issues associated with a changing workforce.</p> <p>6. Describe what employers can do to prevent workplace discrimination.</p> <p>7. Differentiate between formal and informal organizations.</p> <p>8. Describe the difference between authority, responsibility, and accountability.</p> <p>9. Explain the purpose of job descriptions and what they should include.</p> <p>10. Distinguish between company policies and procedures.</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>11. Describe the role of a crew leader.</li> <li>12. List the characteristics of effective leaders.</li> <li>13. Be able to discuss the importance of ethics in a supervisor's role.</li> <li>14. Identify the three styles of leadership.</li> <li>15. Describe the forms of communication.</li> <li>16. Describe the four parts of verbal communication.</li> <li>17. Describe the importance of active listening.</li> <li>18. Explain how to overcome the barriers to communication.</li> <li>19. List ways that leaders can motivate their employees.</li> <li>20. Explain the importance of delegating and implementing policies and procedures.</li> <li>21. Distinguish between problem solving and decision making.</li> <li>22. Explain the importance of safety.</li> <li>23. Give examples of direct and indirect costs of workplace accidents.</li> <li>24. Identify safety hazards of the construction industry.</li> <li>25. Explain the purpose of OSHA.</li> <li>26. Discuss OSHA inspection procedures.</li> <li>27. Identify the key points of a safety program.</li> <li>28. List steps to train employees on how to perform new tasks safely.</li> <li>29. Identify a crew leader's safety responsibilities.</li> <li>30. Explain the importance of having employees trained in first aid and cardiopulmonary resuscitation (CPR).</li> <li>31. Describe the indications of substance abuse.</li> <li>32. List the essential parts of an accident investigation.</li> <li>33. Describe ways to maintain employee interest in safety.</li> <li>34. Distinguish between company policies and procedures.</li> <li>35. Describe the three phases of a construction project.</li> <li>36. Define the three types of project delivery systems.</li> <li>37. Define planning and describe what it involves.</li> <li>38. Explain why it is important to plan.</li> <li>39. Describe the two major stages of planning.</li> <li>40. Explain the importance of documenting job site work.</li> </ol>

Course Code	Course Name	Essential Standards
		41. Describe the estimating process. 42. Explain how schedules are developed and used. 43. Identify the two most common schedules. 44. Explain how the critical path method (CPM) of scheduling is used. 45. Describe the different costs associated with building a job. 46. Explain the crew leader's role in controlling costs. 47. Illustrate how to control the main resources of a job: materials, tools, equipment, and labor. 48. Explain the differences between production and productivity and the importance of each. 49. Demonstrate performance tasks."
<b>Plumbing</b>		
6280	Plumbing 1	<b>A. Student Organizations</b> 1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO). 2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses. 3. Explain the benefits and responsibilities of being a member of a CTSO. 4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities. 5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.  <b>B. Technology Knowledge</b> 1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation. 2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes. 3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks. 4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).

Course Code	Course Name	Essential Standards
		<p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p>D. Professional Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> <li>13. Demonstrate customer-service skills.</li> </ol> <p>NCCER® Contren Core Modules Module A: Safety</p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Follow safe procedures for lifting heavy objects.</p> <p>8. Describe safe behavior on and around ladders and scaffolds.</p> <p>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</p> <p>10. Describe fire prevention and firefighting techniques.</p> <p>11. Define safe work procedures around electrical hazards.</p> <p>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</p> <p>13. Complete Performance Tasks</p> <p>Module B: Construction Math</p> <p>1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.</p> <p>2. Use a standard ruler and a metric ruler to measure.</p> <p>3. Add, subtract, multiply, and divide fractions.</p> <p>4. Add, subtract, multiply, and divide decimals, with and without a calculator.</p> <p>5. Convert decimals to percent and percent to decimals.</p> <p>6. Convert fractions to decimals and decimals to fractions.</p> <p>7. Explain what the metric system is and how it is important in the construction trade.</p> <p>8. Recognize and use metric units of length, weight, volume, and temperature.</p> <p>9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.</p> <p>Module C: Introduction To Hand Tools</p> <p>1. Recognize and identify various types of basic hand tools used in the construction trade.</p> <p>2. Identify and describe how to use various types of measurement and layout tools.</p> <p>3. Identify and explain how to use various types of cutting and shaping tools.</p> <p>4. Use these tools safely.</p> <p>5. Describe the basic procedures for taking care of these tools.</p> <p>6. Complete Performance Tasks</p>

Course Code	Course Name	Essential Standards
		<p>Module E: Introduction To Construction Drawings/Recommend Blueprint Reading</p> <ol style="list-style-type: none"> <li>1. Identify and describe various types of construction drawings, including their fundamental components and features.</li> <li>2. Recognize and identify basic blueprint terms, components, and symbols.</li> <li>3. Relate information on blueprints to actual locations on the print.</li> <li>4. Recognize different classifications of drawings.</li> <li>5. Interpret and use drawing dimensions.</li> <li>6. Complete Performance Tasks</li> </ol> <p>Employability Skills. Use Microburst EmployABILITY skills or SkillsUSA Career Essentials for softskills. Additional Standards to be addressed will be determined by a pre-test assessment.</p> <p>Introduction To The Plumbing Profession</p> <ol style="list-style-type: none"> <li>1. Describe the history of the plumbing profession.</li> <li>2. Identify the responsibilities of a person working in the construction industry.</li> <li>3. State the personal characteristics of a professional.</li> <li>4. Identify the stages of progress within the plumbing profession and its positive impact on society."</li> </ol>
6281	Plumbing 2	<p>Plumbing Tools</p> <p>Effective plumbing professionals demonstrate basic knowledge and use of various plumbing tools as needed in their role. The following accountability criteria are considered essential for students in the plumbing program of study.</p> <ol style="list-style-type: none"> <li>1. Identify the basic hand and power tools used in the plumbing trade.</li> <li>2. Demonstrate the proper use of plumbing tools.</li> <li>3. Demonstrate the ability to know when and how to select the proper tool(s) for various tasks.</li> <li>5. Demonstrate the proper maintenance for caring for hand and power tools.</li> <li>6. Demonstrate how to prepare a surface for tool use.</li> <li>7. Describe the safety requirements for using plumbing tools.</li> </ol>

Course Code	Course Name	Essential Standards
		<p><b>Introduction to Plumbing Drawings</b>  Effective plumbing professionals demonstrate knowledge and use of construction drawings as needed in their role. The following accountability criteria are considered essential for students in the plumbing program of study.</p> <ol style="list-style-type: none"> <li>1. Identify pictorial (isometric and oblique), schematic, and orthographic drawings, and discuss how different views are used to depict information about objects.</li> <li>2. Identify the basic symbols used in schematic drawings of pipe assemblies.</li> <li>3. Explain the types of drawings that may be included in a set of plumbing drawings and the relationship among the different drawings.</li> <li>4. Interpret plumbing-related information from a set of plumbing drawings.</li> <li>5. Sketch orthographic and schematic drawings.</li> <li>6. Use an architect's scale to draw lines to scale and to measure lines drawn to scale.</li> <li>7. Discuss how code requirements apply to certain drawings.</li> </ol> <p><b>Plastic Pipe and Fittings</b>  Effective plumbing professionals demonstrate knowledge and use of various plastic pipe and fittings as needed in their role. The following accountability criteria are considered essential for students in the plumbing program of study.</p> <ol style="list-style-type: none"> <li>1. Identify types of materials and schedules of plastic piping.</li> <li>2. Identify proper and improper applications of plastic piping.</li> <li>3. Identify types of fittings and valves used with plastic piping.</li> <li>4. Identify and determine the kinds of hangers and supports needed for plastic piping.</li> <li>5. Identify the various techniques used in hanging and supporting plastic piping.</li> <li>6. Properly measure, cut, and join plastic piping.</li> <li>7. Explain proper procedures for the handling, storage, and protection of plastic pipes.</li> </ol> <p><b>Copper Pipe and Fittings</b>  Effective plumbing professionals demonstrate knowledge and use of various copper pipe and fittings as needed in their role. The following accountability criteria are considered essential for students in the plumbing program of study.</p> <ol style="list-style-type: none"> <li>1. Identify the types of materials and schedules used with copper piping.</li> </ol>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>2. Identify the material properties, storage, and handling requirements of copper piping.</li> <li>3. Identify the types of fittings and valves used with copper piping.</li> <li>4. Identify the techniques used in hanging and supporting copper piping.</li> <li>5. Properly measure, ream, cut, and join copper piping.</li> <li>6. Identify the hazards and safety precautions associated with copper piping."</li> </ol>
6282	Plumbing 3	<p>Cast-Iron Pipe and Fittings</p> <ol style="list-style-type: none"> <li>1. Recognize proper and improper applications of cast-iron piping.</li> <li>2. Identify the material properties, storage, and handling requirements of carbon steel piping.</li> <li>3. Identify the types of materials and schedules used in cast-iron piping.</li> <li>4. Identify the types of fittings used with cast-iron piping.</li> <li>5. Identify the various techniques used in handling and supporting cast-iron piping.</li> <li>6. Properly measure, cut, and join cast-iron piping.</li> <li>7. Identify the hazards and safety precautions associated with cast-iron piping.</li> </ol> <p>Carbon Steel Pipe and Fittings</p> <ol style="list-style-type: none"> <li>1. Recognize proper applications of carbon steel piping.</li> <li>2. Identify the material properties, storage, and handling requirements of carbon steel piping.</li> <li>3. Identify the various techniques used in hanging and supporting carbon steel piping.</li> <li>4. Properly measure, cut, groove, thread, and join carbon steel piping.</li> </ol> <p>Corrugated Stainless Steel Tubing</p> <ol style="list-style-type: none"> <li>1. Identify the common manufacturers of corrugated stainless steel tubing.</li> <li>2. Recognize proper and improper applications of corrugated stainless steel tubing.</li> <li>3. Identify the various techniques used in hanging and supporting corrugated stainless steel tubing.</li> <li>4. Explain how to properly measure, cut, join, and groove corrugated stainless steel tubing.</li> <li>5. Identify the material properties, storage, and handling requirements of corrugated stainless steel tubing."</li> </ol>

Course Code	Course Name	Essential Standards
6283	Plumbing 4	<p>Fixtures and Faucets</p> <ol style="list-style-type: none"> <li>1. Identify the basic types of materials used in the manufacture of plumbing fixtures.</li> <li>2. Discuss common types of sinks, lavatories, and faucets.</li> <li>3. Identify and discuss common types of bathtubs, bath-shower modules, shower stalls, and shower baths.</li> <li>4. Discuss common types of toilets, urinals, and bidets.</li> <li>5. Identify and describe common types of drinking fountains and water coolers.</li> <li>6. Discuss common types of garbage disposals and domestic dishwashers.</li> </ol> <p>Introduction to Drain, Waste, And Vent (DWV) Systems</p> <ol style="list-style-type: none"> <li>1. Explain how waste moves from a fixture through the drain system to the environment.</li> <li>2. Identify the major components of a drainage system and describe their functions.</li> <li>3. Identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals.</li> <li>4. Identify the various types of drain, waste, and vent (DWV) fittings and describe their applications.</li> <li>5. Identify significant code and health issues, violations, and consequences related to DWV systems.</li> </ol> <p>Introduction to Water Distribution Systems</p> <ol style="list-style-type: none"> <li>1. Describe the process by which water is distributed in municipal, residential, and private water systems.</li> <li>2. Identify the major components of a water distribution system, and describe the function of each component.</li> <li>3. Explain the relationships between components of a water distribution system."</li> </ol>

## Arts, Audio-Video Technology, and Construction Cluster

Course Code	Course Name	Essential Standards
<b>Fashion Design and Apparel Construction</b>		
5710	Fashion Design and Apparel Construction 1	<p>B1. Analyze career pathways and professional character traits in the costume, fashion and textile industries.</p> <p>C1. Explain the components of the fashion industry.</p> <p>D1. Evaluate fibers and fabrics for apparel use.</p> <p>E1. Apply technical design skills to develop a product.</p> <p>F1. Demonstrate mastery of technical construction skills.</p> <p>G1. Evaluate marketing and merchandising strategies for apparel products.</p>
5711	Fashion Design and Apparel Construction 2	<p>B1. Create a comprehensive occupation plan for selected careers in the costume, fashion, and textile industries.</p> <p>C1. Integrate components of the fashion industry into a culminating project.</p> <p>D1. Apply textile industry standards to create an apparel product.</p> <p>E1. Demonstrate advanced design skills to develop a product.</p> <p>F1. Integrate industry standards in the construction process.</p> <p>G1. Create a marketing campaign for apparel products.</p>
<b>Interior Design</b>		
5455	Interior Design 1	<p>B1. Analyze career paths within the interior design industry.</p> <p>C1. Identify architectural styles and furniture design throughout history.</p> <p>C2. Analyze the application of the elements and principles of design.</p> <p>C3. Create designs with various media.</p> <p>D1. Evaluate interior furnishings and products in meeting specific design needs.</p> <p>E1. Analyze professional practices.</p>

Course Code	Course Name	Essential Standards
5456	Interior Design 2	B1. Evaluate a career plan designed to meet personal goals and objectives. C1. Identify trends and new technologies in interior design and construction components. D1. Generate creative solutions for problems within interior environments. E1. Analyze client needs, goals, and resources in creating design plans. F1. Demonstrate design ideas through a variety of presentation media. G1. Evaluate professional practices that lead to successful business operations.
<b>Digital Art and Design</b>		
6120	Digital Art and Design 1	C. Legal Requirements and Ethical Considerations C. 1 Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation C. 2 Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes C. 9 Describe ethical and legal practices of safeguarding the confidentiality of business-related information C. 10 Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks  F. Basic Drawing Skills and Media Exposure F. 6 Prepare photos and artwork for reproduction F. 7 Prepare compositional layout  G. Typography G. 3 Illustrate caps, lowercase, uppercase, small caps, and ligatures G. 5 Distinguish between display (headline) type and body (text) type by their point sizes, styles, and uses  H. Pre-Production Practices H.1 Demonstrate an understanding of the relationship between message, color, typography, images, and layout

Course Code	Course Name	Essential Standards
		<p>I. Production Practices  I.1. List procedures used to ensure proper execution of a production plan include keeping time log.</p> <p>J. Photographic Principles  J.1. Distinguish between digital and conventional photography  J.2. Capture digital images using a scanner and other digital devices</p> <p>K. Document Layout: Adobe InDesign  K.1. Define and utilize units of measure and proper uses of each (e.g., points, pixels, and/or inches).  K.2. Import copy from a word processing program and format in a page layout program.  K.3. Create multiple page documents using text blocks, graphics, frames, and headings using drop caps and wrap-a-rounds (run-a-rounds).  K.4. Export print-ready Portable Document Format (PDF) using page layout software.  K.5. Demonstrate having a plan by creating a dummy and impose a multiple-page document.</p>
6121	Digital Art and Design 2	<p>H. Pre-Production Practices  6. Demonstrate best practices in concept development including layout and copy.  7. Maintain an ongoing sketch book/notebook  13. Explain color theory as it applies to design: additive, subtractive, CMYK, RGB, and Web safe.</p> <p>I. Production Practices  5. Choose appropriate design software applications to create art for end use.  6. Create original production pieces, meeting goals, timeline, and elements of style and design.  10. Collaborate with others to design and produce a finished project.</p>

Course Code	Course Name	Essential Standards
		<p>J. Photographic Principles</p> <ul style="list-style-type: none"> <li>3. Capture digital images using a scanner and other digital devices.</li> <li>6. Download/upload a digital image from various sources</li> </ul> <p>K. Document Layout: Adobe InDesign</p> <ul style="list-style-type: none"> <li>12. Locate examples of ad sizes from publications (full-page, half-page, and quarter-page ads).</li> <li>17. Produce digital files using appropriate dots per inch (DPI) and pixels per inch (PPI) resolution for media.</li> </ul> <p>L. Image Creation and Manipulation: Adobe Photoshop</p> <ul style="list-style-type: none"> <li>2. Use multiple input devices to import photos, images, and other content for a variety of digital uses.</li> <li>3. Use proper settings when choosing line-art, grayscale, and color scanning.</li> <li>9. Demonstrate layer management techniques including groups and folders.</li> </ul> <p>M. Vector Illustration: Adobe Illustrator</p> <ul style="list-style-type: none"> <li>8. Apply proper settings when saving or importing/exporting graphics.</li> <li>9. Create or trace drawings/photographs with pen or live trace</li> </ul> <p>N. Computer Basics</p> <ul style="list-style-type: none"> <li>Create and manage files and folders</li> </ul> <p>O. Professional Development</p> <ul style="list-style-type: none"> <li>2. Create professional materials: cover letter, resume, formal letters, and emerging technologies.</li> <li>3. Analyze your digital footprint, including but limited to gamer tags, avatars, e-mail addresses, and social media content</li> </ul>

Course Code	Course Name	Essential Standards
6121	Digital Art and Design 3	<p>H. Pre-Production Practices</p> <p>15. Demonstrate appropriate use of space (positive vs. negative; size and proportion).</p> <p>16. Identify elements of design: line, shape, form, space, texture, value, and color.</p> <p>I. Production Practices</p> <p>7. Demonstrate appropriate editing, proofing (spelling/grammar), and journalism skills.</p> <p>8. Demonstrate procedures to prepare work for presentation (mounting, craftsmanship, digital portfolio).</p> <p>9. Critique a layout to determine if it meets the customer’s needs, and suggest improvements.</p> <p>J. Photographic Principles</p> <p>8. Apply camera modes, light and color principles, image stabilization, exposure, shutter speed, and aperture.</p> <p>K. Document Layout: Adobe InDesign</p> <p>13. Demonstrate an understanding of native file formats and file extensions (e.g., ai, jpg, psd, gif, png, indd, pdf, etc.), file organization, and file naming conventions.</p> <p>14. Demonstrate an understanding of usability</p> <p>L. Image Creation And Manipulation: Adobe Photoshop</p> <p>10. Define and demonstrate non-destructive and destructive editing techniques including: adjustment layers, masks, and channels.</p> <p>11. Differentiate between raster file and bitmap formats.</p> <p>M. Vector Illustration: Adobe Illustrator</p> <p>10. Create basic shapes using drawing or pen tool such as triangles, boxes, circles, etc.</p> <p>11. Demonstrate assigning fill and stroke to objects.</p> <p>N. Computer Basics</p> <p>4. Create and manage files and folders.</p>

Course Code	Course Name	Essential Standards
		<p>5. Save, retrieve, load, format, import data into, and export a variety of electronic documents (word processing, spreadsheet, database, design software, etc.).</p> <p>O. Professional Development</p> <p>3. Analyze your digital footprint, including but limited to gamer tags, avatars, e-mail addresses, and social media content.</p> <p>4. Research, develop, maintain, and present a portfolio.</p>
6122	Digital Art and Design 4	<p>H. Pre-Production Practices</p> <p>17. Identify principles of design: contrast, unity, repetition, rhythm, balance, emphasis, and proportion.</p> <p>I. Production Practices</p> <p>13. Perform proportionate reasoning to estimate quantities, such as determining the appropriate scale of an image for a given sheet size.</p> <p>14. Recognize and utilize size, weight, quantities, type, and amount of paper necessary for fulfilling a job order.</p> <p>J. Photographic Principles</p> <p>10. Define and explain white balance, positive and negative space, depth of field, and shutter speed.</p> <p>11. Read and interpret instructional narratives, such as technical manuals, to perform basic photographic techniques</p> <p>K. Document Layout: Adobe InDesign</p> <p>18. Apply mathematics concepts and measurement techniques to design and finish layouts (e.g., converting fractions to decimals to the precision of 1/16 of an inch, working with different measurement units, and utilizing rulers and guidelines.)</p> <p>19. Incorporate the use of image manipulation and illustration software into final products.</p>

Course Code	Course Name	Essential Standards
		<p>L. Image Creation And Manipulation: Adobe Photoshop</p> <p>12. Explain how to save an original file with layers for future editing.</p> <p>13. Demonstrate the procedures for editing raster-based imagery, both high resolution and low resolution, in CMYK and RGB, and preparing files for both print and web media.</p> <p>M. Vector Illustration: Adobe Illustrator</p> <p>12. Demonstrate proficiency in transforming objects.</p> <p>13. Apply attributes, styles, and effects</p> <p>14. Assign color matching systems (PMS), blends, and effects to create a unified vector image by selecting colors from color swatch libraries.</p> <p>N. Computer Basics</p> <p>6. Utilize desktop and online file management services to store, share, and backup files.</p> <p>7. Demonstrate the proper use of a variety of external peripherals and how they connect to a computer.</p> <p>8. Demonstrate the understanding of file sharing, file permissions, security, and transferring information.</p> <p>O. Professional Development</p> <p>4. Research, develop, maintain, and present a portfolio.</p> <p>5. Utilize critique and peer review including a respect for peers' work and the ability to give and receive constructive criticism.</p> <p>6. Conduct critiques, peer reviews, and self-evaluations using rubrics.</p>
<b>Graphic Communication</b>		
5205	Introduction to Graphic Communication	<p>C. File Creation to Output</p> <p>File Creation and Design</p> <p>35. Identify common components of page:</p> <p>a. text,</p>

Course Code	Course Name	Essential Standards
		<p>b. illustrations, and c. photographs.</p> <p>47. Contrast color reproduction viewed on digital display (e.g., monitor, TV, tablet, smartphone) versus print.</p> <p>Print Output</p> <p>58. Define imposition. 59. Define trapping. 60. Define bleed. 61. Gather samples of full bleed and no bleed printed examples. 62. Explain the purpose of proofing. 63. Compare hard and soft proofs</p> <p>Digital Output</p> <p>Compare the advantages/-disadvantages of e-publishing/e-books versus traditional books.</p> <p>D. Offset Press</p> <p>Review components of an offset press.</p> <p>a. Describe a printing unit:</p> <p>i. inkling system, ii. water system, iii. plate cylinder, iv. blanket cylinder, and v. impression cylinder</p> <p>E. Digital Press</p> <p>Review components of digital presses:</p> <p>a. digital front end Raster Image Processor (RIP), b. print engine, and i. toner based (electrophotography) and ii. inkjet c. delivery systems.</p>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>i. roll to roll,</li> <li>ii. stacker, and</li> <li>iii. in-line finishing</li> </ul> <p>G. Bindery, Finishing And Distribution Bindery and Finishing Determine grain direction of paper.</p> <ul style="list-style-type: none"> <li>84. Explain the importance of grain direction.</li> <li>85. Describe a folded signature.</li> <li>86. Describe bindery and finishing options. <ul style="list-style-type: none"> <li>a. loose leaf,</li> <li>b. saddle stitch,</li> <li>c. perfect bind,</li> <li>d. case binding,</li> <li>e. lay flat binding,</li> <li>f. die cutting,</li> <li>g. embossing/debossing, and</li> <li>h. foil stamping.</li> </ul> </li> <li>87. Contrast use and benefits of each binding option.</li> <li>88. Create 16 page saddle stitch booklet.</li> </ul> <p>Finishing Equipment Describe in-line, near-line and off-line finishing.</p> <ul style="list-style-type: none"> <li>90. Identify commonly used finishing and binding equipment and supplies: <ul style="list-style-type: none"> <li>a. padding,</li> <li>b. stapling,</li> <li>c. stitching,</li> <li>d. punching/drilling,</li> <li>e. folding, and</li> <li>f. collating.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
6200	Graphic Communications 1	<p>A. Offset Press Configurations</p> <p>When working with offset press equipment:</p> <ol style="list-style-type: none"> <li>2. Describe a job jacket/ticket.</li> <li>3. Create a job jacket/ticket using an instructor specified print job.</li> <li>4. Identify the basic systems and parts of an offset press:               <ol style="list-style-type: none"> <li>a. feeder,</li> <li>b. printing unit, and</li> <li>c. delivery.</li> </ol> </li> <li>5. Describe the paper path of a sheet fed offset press.</li> <li>6. Identify common maximum sheet sizes of sheet fed offset presses.</li> <li>7. List common speeds (impressions per hour) of sheet fed and web fed presses.</li> <li>8. Describe paper path of a web (roll) fed offset press.</li> <li>9. Compare the advantages and disadvantages of a web fed offset press versus a sheet fed offset press.</li> <li>10. Evaluate printed samples produced on a web fed offset and sheet fed offset press.</li> <li>11. Describe perfecting and compare the features of a perfecting press versus non-perfecting press.</li> <li>12. Identify components of a printing unit by sketching an illustration:               <ol style="list-style-type: none"> <li>a. inking system,</li> <li>b. dampening system,</li> <li>c. plate cylinder,</li> <li>d. blanket cylinder, and</li> <li>e. impression cylinder.</li> </ol> </li> <li>13. Describe a single color offset press.</li> </ol> <p>B. Paper</p> <ol style="list-style-type: none"> <li>26. Identify characteristics of paper:         <ol style="list-style-type: none"> <li>a. weight,</li> <li>b. finish,</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<p>c. thickness,  d. brightness,  e. opacity, and  f. grain direction.</p> <p>27. Identify weight, coating, and size from a label found on a ream, box, or skid of paper.</p> <p>28. Determine grain direction of five different types of papers used in the offset printing process.</p> <p>29. Describe how grain direction will affect the running of a press, folding, scoring, and binding.</p> <p>30. Describe wire versus felt side of paper.</p> <p>31. Describe a watermark in paper.</p> <p>32. Identify specialty substrates:  a. carbonless,  b. pressure sensitive,  c. gummed label,  d. plastic based, and  e. metal.</p> <p>C. Ink</p> <p>38. Identify process and spot color areas from selected sample print job.</p> <p>39. Describe the procedure for mixing and testing custom colored inks.</p> <p>D. Dampening Solution</p> <p>43. Describe the components of dampening solution.</p> <p>44. Describe the purpose and operation of a dampening system</p> <p>E. Make-Ready</p> <p>a. number of colors,  b. imposition,  c. quantity, and  d. type of paper.</p>

Course Code	Course Name	Essential Standards
		<p>48. Describe a folding dummy.</p> <p>49. Distinguish imposition of printing jobs:</p> <ul style="list-style-type: none"> <li>a. sheetwise,</li> <li>b. work-and-turn, and</li> <li>c. work-and-tumble.</li> </ul> <p>50. Identify marks on press sheet:</p> <ul style="list-style-type: none"> <li>a. registration,</li> <li>b. trim,</li> <li>c. bleed, and</li> <li>d. fold</li> </ul> <p>F. Print</p> <p>Explain the operational procedures, controls, and adjustments for each system (feeding, printing, and delivery) on the offset press.</p> <p>65. Describe the use of flags to signify waste sheets during a pressrun.</p> <p>66. Print a single-color one-sided job.</p> <p>67. Print a single-color registered two-sided job.</p> <p>68. Locate gripper and guide sides on a single-color registered two-sided job.</p> <p>69. Print a job on heavyweight stock.</p> <p>70. Print a two-sided job using the following methods:</p> <ul style="list-style-type: none"> <li>a. sheetwise,</li> <li>b. work-and-turn, and,</li> <li>c. work-and-tumble</li> </ul>
6201	Graphic Communications 2	<p>B. Design And Prepress</p> <p>Demonstrate use of computer menus, shortcut keys, and panels in illustration software.</p> <p>12. Describe different types of graphics used in screen-printing:</p> <ul style="list-style-type: none"> <li>a. line art,</li> <li>b. continuous tone,</li> <li>c. raster, and</li> <li>d. vector.</li> </ul> <p>13. Define pixels per inch resolution (screen display).</p>

Course Code	Course Name	Essential Standards
		<p>14. Define dots per inch.  15. Define lines per inch resolution (printing press).  16. Describe an encapsulated postscript (EPS) file.  17. Explain the use of an EPS file.  18. Demonstrate the proper setup of a document using an instructor specified page size.</p> <p><b>C. Frame And Mesh Preparation</b>  List different mesh counts, thread diameters, and mesh type (calendared, steel, and fabric).  36. Determine the appropriate choice of mesh count and thread diameter for an instructor specified substrate/image.  37. List different frame types/construction.  38. Choose an appropriate frame for an instructor specified job.  39. Describe the process of attaching mesh onto a fixed and/or retensionable frame system.</p> <p><b>D. Stencil and Screen Preparation</b>  Specify the workflow steps used to make a screen.  46. Describe emulsion used to make a screen (capillary, liquid and film).  47. Explain the use of emulsion when making a screen.  48. Choose appropriate type of emulsion for an instructor specified job.  49. Describe requirements to prepare the screen for a stencil application.  50. Demonstrate the proper application of emulsion to the screen.  51. Demonstrate the proper drying requirements of the screen.</p> <p><b>E. Print Production</b>  Describe the alignment of screens for proper registration.  65. Demonstrate the proper alignment of screens for a specific job.  66. Define flood stroke.  67. Define print stroke.  68. Define off contact and peel.  69. Demonstrate the proper setting of off contact to control image quality.  70. Demonstrate the proper application of ink to screen.  71. Demonstrate the proper loading and alignment of substrate on press.  72. Demonstrate the proper adjustment of Squeegee pressure for an instructor specified job.</p>

Course Code	Course Name	Essential Standards
6202	Graphic Communications 3	<p><b>A. Bindery and Finishing Technologies</b>  Requirements when working with bindery and finishing equipment.  95. Summarize the finishing production information on a job jacket/ticket.  96. Prepare folding dummies from instructor specified impositions.  97. Demonstrate how to check the squareness of stock.  98. Demonstrate paper jogging techniques.  99. Demonstrate paper sheet counting techniques by:  a. ream marker,  b. weight, and</p> <p>100. Identify hand tools, equipment, and materials in bindery operations.  101. Identify in-line finishing systems.  102. Identify off-line finishing systems.  103. Describe specialty finishing techniques:  a. foil stamping,  b. embossing/debossing,  c. perforation,  d. drilling/punching,  e. scoring,  f. die cutting,  g. coating, and  h. lamination.</p> <p>104. Determine key activities within a bindery operation in a commercial printing plant either on site or online via a virtual tour.  105. Determine the skills required to work in a bindery operation</p> <p><b>B. Cutting</b>  Calculate basic paper cuts from a parent sheet, considering job requirements and grain direction.  110. Draw a layout of cuts required for an instructor specified printed job.  111. Create numbered sequence of cuts for an instructor specified printed job.  112. Describe setup and use of programmable guillotine cutter.  113. Demonstrate proper cutting procedures for an instructor specified job.</p> <p><b>C. Folding</b>  Assess instructor supplied paper samples for suitability when folding.</p>

Course Code	Course Name	Essential Standards
		<p>115. Describe folding configurations:</p> <ul style="list-style-type: none"> <li>a. half fold,</li> <li>b. tri fold,</li> <li>c. Z fold,</li> <li>d. Accordion fold,</li> <li>e. gate fold, and</li> <li>f. French fold.</li> </ul> <p>116. Demonstrate the use of folding equipment to produce:</p> <ul style="list-style-type: none"> <li>a. half fold,</li> <li>b. tri fold,</li> <li>c. Z fold,</li> <li>d. Accordion fold,</li> <li>e. gate fold, and</li> <li>f. French fold.</li> </ul> <p>117. Describe the uses and customer application of common folds.</p> <p>118. Describe folding techniques:</p> <ul style="list-style-type: none"> <li>a. right angle folding,</li> <li>b. knife folding,</li> <li>c. buckle folding, and</li> <li>d. combination folding.</li> </ul> <p>119. Describe scoring.</p> <p>120. Describe the advantages/disadvantages of using a press or a folder to score or perforate sheets.</p> <p>Assess instructor supplied paper samples for suitability when folding.</p> <p>115. Describe folding configurations:</p> <ul style="list-style-type: none"> <li>a. half fold,</li> <li>b. tri fold,</li> <li>c. Z fold,</li> <li>d. Accordion fold,</li> <li>e. gate fold, and</li> <li>f. French fold.</li> </ul> <p>116. Demonstrate the use of folding equipment to produce:</p> <ul style="list-style-type: none"> <li>a. half fold,</li> <li>b. tri fold,</li> </ul>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>c. Z fold,</li> <li>d. Accordion fold,</li> <li>e. gate fold, and</li> <li>f. French fold.</li> </ul> <p>117. Describe the uses and customer application of common folds.</p> <p>118. Describe folding techniques:</p> <ul style="list-style-type: none"> <li>a. right angle folding,</li> <li>b. knife folding,</li> <li>c. buckle folding, and</li> <li>d. combination folding.</li> </ul> <p>119. Describe scoring.</p> <p>120. Describe the advantages/disadvantages of using a press or a folder to score or perforate sheets.</p> <p><b>D. Collation</b></p> <p>121. Review workflow steps used for collating sets of print.</p> <p>122. Compare the collating ability of digital presses versus offset.</p> <p>123. Demonstrate proper collation of sets in correct sequence for an instructor specified job.</p> <p><b>E. Binding</b></p> <p>124. Describe binding:</p> <ul style="list-style-type: none"> <li>a. side stitch,</li> <li>b. saddle stitch,</li> <li>c. perfect bind,</li> <li>d. coil bind,</li> <li>e. wire bound,</li> <li>f. comb binding,</li> <li>g. velo binding, and</li> <li>h. padding.</li> </ul> <p>125. Discuss reasons why customers choose different binding applications.</p> <p>126. Assess instructor supplied paper samples for suitability when binding.</p> <p>127. Identify spiral binding, perfect bind, and wire binding equipment.</p> <p>128. Define crossover.</p> <p>129. Define creep of pages when folding a signature.</p>

Course Code	Course Name	Essential Standards
		<p>F. Trimming</p> <p>130. Discuss types of projects that require trimming.</p> <p>131. Explain the role of trimming to create a bleed effect.</p> <p>132. Use a paper cutter to trim bound books.</p> <p>G. Packing</p> <p>133. Identify packaging and shrink wrap equipment and materials.</p> <p>134. Summarize packaging information on job jacket/ticket.</p>
6203	Graphic Communication 4	<p>Digital File Preparation and Output</p> <p>A. Type</p> <ol style="list-style-type: none"> <li>1. Discuss the role of type as a design element in graphic communications.</li> <li>2. Compare the physical characteristics of basic type classifications: <ol style="list-style-type: none"> <li>a. serif and</li> <li>b. sans serif.</li> </ol> </li> <li>3. Identify the physical characteristics of type classifications: <ol style="list-style-type: none"> <li>a. bold,</li> <li>b. italic, and</li> <li>c. Roman.</li> </ol> </li> <li>4. Identify the physical characteristics of typographic characters: <ol style="list-style-type: none"> <li>a. uppercase,</li> <li>b. lowercase,</li> <li>c. small caps,</li> <li>d. ligatures,</li> <li>e. glyphs,</li> <li>f. subscript, and</li> <li>g. superscript.</li> </ol> </li> <li>5. Identify typographic ems and ens and their associated dashes.</li> <li>6. Explain the use of points and picas as measurement increments.</li> <li>7. Identify the physical characteristics of type: <ol style="list-style-type: none"> <li>a. X-height,</li> <li>b. mean-line,</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>c. baseline,</li> <li>d. ascender,</li> <li>e. descender,</li> <li>f. leading (spacing),</li> <li>g. tracking, and</li> <li>h. kerning</li> </ul> <p>8. Compare display (headline) type and body (text) type by their point sizes and type styles.</p> <p>9. Recognize text alignment:</p> <ul style="list-style-type: none"> <li>a. flush left,</li> <li>b. flush right,</li> <li>c. center, and</li> <li>d. justify.</li> </ul> <p>10. Compare the differences of typeface technologies:</p> <ul style="list-style-type: none"> <li>a. TrueType,</li> <li>b. PostScript Type 1, and</li> <li>c. OpenType.</li> </ul> <p>11. Describe font substitution when outputting a printed page.</p> <p>12. Assess the effectiveness of a communication piece using different applications of type.</p> <p><b>B. Page Layout and Design</b></p> <p>13. Review professional Page Layout software applications:</p> <ul style="list-style-type: none"> <li>a. Adobe InDesign,</li> <li>b. QuarkXPress, and</li> <li>c. Microsoft Publisher.</li> </ul> <p>14. Review office/home-based software applications:</p> <ul style="list-style-type: none"> <li>a. Microsoft Office (Word and PowerPoint) and</li> <li>b. Google Docs.</li> </ul> <p>15. Demonstrate use of computer menus, shortcut keys, and panels in an instructor specified page layout software.</p> <p>16. Create a multi-page document using:</p> <ul style="list-style-type: none"> <li>a. number of pages,</li> <li>b. facing pages,</li> </ul>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>c. page size and orientation,</li> <li>d. columns,</li> <li>e. margins,</li> <li>f. bleeds, and</li> <li>g. slugs</li> </ul> <p>17. Utilize page layout software to place text from a word-processed file into a multi-page document.</p> <p>18. Demonstrate the use of a digital dictionary and spell checker.</p> <p>19. Demonstrate changing type attributes using:</p> <ul style="list-style-type: none"> <li>a. font,</li> <li>b. size,</li> <li>c. style, and</li> <li>d. color.</li> </ul> <p>20. Demonstrate changing type alignment attributes:</p> <ul style="list-style-type: none"> <li>a. flush left,</li> <li>b. flush right,</li> <li>c. center,</li> <li>d. justify, and</li> <li>e. justification (top, center, and bottom justified).</li> </ul> <p>21. Demonstrate instructor specified paragraph formatting to text:</p> <ul style="list-style-type: none"> <li>a. indents (left, right, and hanging),</li> <li>b. spaces before and after,</li> <li>c. line spacing,</li> <li>d. drop caps,</li> <li>e. tabs, and</li> <li>f. object alignment and distribution.</li> </ul> <p>22. Describe page break.</p> <p>23. Describe widow and orphan formatting.</p> <p>24. Demonstrate line break formatting including hyphenation and widow and orphan control.</p> <p>25. Assess proper line and page breaks including hyphenation, widows and orphans in an instructor specified page.</p>

Course Code	Course Name	Essential Standards
		<p>26. Describe master pages.</p> <p>27. Explain automatic folio numbering.</p> <p>28. Explain the purpose of style sheets.</p> <p>29. Identify masthead (header and footer).</p> <p>30. Create a multiple page document using master pages, automatic folios, and styles (character, paragraph, and object styles), masthead, and graphics.</p> <p>31. Describe the use of a table in a page layout software.</p> <p>32. Create a document that includes tables.</p> <p>33. Explain the use of a graphic box in a page layout software.</p> <p>34. Explain the use of color tint fills.</p> <p>35. Create a document using an instructor specified color tint fill.</p> <p>36. Plan the steps of preflighting, proofing (hard and soft), packaging all files, and creating an output-appropriate PDF.</p> <p>37. Define variable data printing.</p> <p>38. Discuss the use of variable data in a printing project.</p> <p>39. Create a flat database with 3 categories in a spreadsheet application for use in a variable data project.</p> <p>40. Design a document that has variable data fields for text and pictures using page layout software with variable data capabilities.</p> <p>41. Produce a variable data-printing job on a digital press or production printer.</p> <p><b>C. Image Capture and Editing</b></p> <p>42. Review professional image editing software applications:</p> <ul style="list-style-type: none"> <li>a. Adobe Photoshop.</li> </ul> <p>43. Demonstrate use of computer menus, shortcut keys, and panels in image editing software.</p> <p>44. Identify different types of graphics:</p> <ul style="list-style-type: none"> <li>a. line art,</li> <li>b. vector,</li> <li>c. raster, and</li> <li>d. continuous tone.</li> </ul> <p>45. Compare examples of various graphic file formats and their extensions:</p>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>a. TIFF (Tagged Image File Format),</li> <li>b. EPS (Encapsulated PostScript),</li> <li>c. BMP (Bitmap),</li> <li>d. PSD (Native Adobe PhotoShop),</li> <li>e. JPG (Joint Photographic Experts Guild), and</li> <li>f. AI (Native Adobe Illustrator).</li> </ul> <p>46. Explain pixels per inch resolution (display).</p> <p>47. Explain dots per inch (output device resolution).</p> <p>48. Explain lines per inch resolution (halftone).</p> <p>49. Discuss minimum resolution requirements for different reproduction devices:</p> <ul style="list-style-type: none"> <li>a. screen display,</li> <li>b. digital press,</li> <li>c. offset press, and</li> <li>d. wide format inkjet press.</li> </ul> <p>50. Identify potential quality issues of improper relationships of pixels per inch (PPI), dots per inch (DPI), and lines per inch (LPI) on final output quality.</p> <p>51. Describe color bit depth.</p> <p>52. Create correct depth and resolution files of line art and continuous tone images using a scanner.</p> <p>53. Describe various camera components and settings used while capturing images:</p> <ul style="list-style-type: none"> <li>a. aperture,</li> <li>b. shutter speed,</li> <li>c. image resolution, and</li> <li>d. white balance.</li> </ul> <p>54. Download a digital image from a stock photography web site; resize and resample according to specifications.</p> <p>55. Discuss RGB (red, green, and blue) additive color model.</p> <p>56. Discuss CMYK (cyan, magenta, yellow, and black) subtractive color model.</p> <p>57. Discuss spot color model (pantone).</p> <p>58. Describe the use of layers, selections and channels in an image editing software program.</p>

Course Code	Course Name	Essential Standards
		<p>59. Use layers, selections and channels to edit a color photograph in an image editing software program.</p> <p>60. Describe image cloning.</p> <p>61. Use an image editing software program to perform image cloning.</p> <p>62. Describe unsharp masking.</p> <p>63. Use an image editing software program to perform varying degrees of unsharp masking.</p> <p>64. Review capabilities of adjusting contrast (tone reproduction) in an image editing software program.</p> <p>65. Use an image editing software program to perform contrast adjustments (tone reproduction) on a color image.</p> <p>66. Review capabilities of adjusting color balance (gray balance) in an image editing software program.</p> <p>67. Use an image editing software program to perform color balance (gray balance) adjustments on a color image.</p> <p>68. Explain the use of optical character recognition (OCR).</p> <p>69. Use optical character recognition (OCR) software to capture printed text.</p> <p><b>D. Illustration</b></p> <p>70. Review the capabilities of professional illustration software applications:</p> <p style="padding-left: 20px;">a. Adobe Illustrator.</p> <p>71. Demonstrate the use of computer menus, shortcut keys, and panels in illustration software.</p> <p>72. Describe a difference between a bitmap and a vector graphic.</p> <p>73. Create a single color vector graphic.</p> <p>74. Create a vector graphic to include tints, fills, strokes, and color.</p> <p>75. Create a vector graphic using manipulated type.</p> <p>76. Convert a bitmap image to a vector.</p> <p>77. Edit an existing piece of vector art.</p> <p><b>E. PDF</b></p> <p>78. Discuss the Adobe Portable Document Format (PDF).</p>

Course Code	Course Name	Essential Standards
		<p>79. Determine the benefits of using a PDF format within the graphic communications industry.</p> <p>80. Evaluate various methods to create PDF files.</p> <p>81. Discuss PDF/x standards.</p> <p>82. Identify the differences among PDF/x standards.</p> <p>83. Describe appropriate PDF creation settings:</p> <ul style="list-style-type: none"> <li>a. resolution,</li> <li>b. page size, and</li> <li>c. fonts inclusion.</li> </ul> <p>84. Demonstrate how to make changes to an existing PDF file.</p> <p>F. Prepress</p> <p>85. Describe a job ticket/docket.</p> <p>86. Describe job specifications from a job ticket/docket.</p> <p>87. Discuss the steps of preflighting a print file.</p> <p>88. Identify common quality issues that are found during preflight process.</p> <p>89. Create a manual checklist of possible quality issues.</p> <p>90. Perform a preflight of a PDF file using a manual checklist.</p> <p>91. Perform corrections to problems found during preflight process:</p> <ul style="list-style-type: none"> <li>a. page size incorrect,</li> <li>b. font substitution, and</li> <li>c. bleeds missing.</li> </ul> <p>92. Discuss the use of trapping an image for print.</p> <p>93. Describe software options for creating traps.</p> <p>94. Choose the proper amount of trap to apply to a digitally created page using page layout, illustration, and/or trapping software.</p> <p>95. Identify imposition styles:</p> <ul style="list-style-type: none"> <li>a. sheetwise,</li> <li>b. work and turn,</li> <li>c. work and tumble,</li> <li>d. multiple up, and</li> </ul>

Course Code	Course Name	Essential Standards
		<p>e. perfecting.</p> <p>96. Demonstrate how to impose an electronic file using digital imposition software.</p> <p>97. Describe a folding dummy for print.</p> <p>98. Create a folding dummy for a 16-page job with proper pagination, fold, and guide marks.</p> <p><b>G. Color Management</b></p> <p>99. Discuss the role of color management in a print workflow.</p> <p>100. Describe color management techniques used in different steps of a print workflow:</p> <ul style="list-style-type: none"> <li>a. monitor,</li> <li>b. proofer,</li> <li>c. digital press,</li> <li>d. offset press, and</li> <li>e. wide format inkjet press.</li> </ul> <p>101. Compare color gamut capabilities of devices used in a print workflow:</p> <ul style="list-style-type: none"> <li>a. monitor,</li> <li>b. proofer,</li> <li>c. digital press,</li> <li>d. offset press, and</li> <li>e. wide format inkjet press.</li> </ul> <p>102. Describe an International Color Consortium (ICC) profile.</p> <p>103. Explain the use of an ICC profile in a print workflow.</p> <p>104. Create ICC color profiles.</p> <p>105. Describe conversion limitations of red, green, blue (RGB) color model to cyan, magenta, yellow, black (CMYK) color model.</p> <p>106. Demonstrate conversion of an RGB image to CMYK using ICC profiles in an image editing software.</p> <p>107. Describe under color removal (UCR).</p> <p>108. Demonstrate the use of proper settings for under color removal (UCR) in an image editing software.</p> <p>109. Describe Gray Component Replacement (GCR).</p>

Course Code	Course Name	Essential Standards
		<p>110. Demonstrate the use of proper settings for Gray Component Replacement (GCR) in an image editing software.</p> <p>111. Define proofing:</p> <ul style="list-style-type: none"> <li>a. hard and</li> <li>b. soft.</li> </ul> <p>112. Create proof using an appropriate ICC profile and explain why profile is used.</p> <p>113. Demonstrate calibration of a color monitor to manufacturer’s specifications.</p> <p>114. Demonstrate calibration of a color proofer to manufacturer’s specifications.</p> <p><b>H. File Systems and File Management</b></p> <p>115. Describe computer networking within a work environment.</p> <p>116. Demonstrate transfer of files within a network.</p> <p>117. Describe font management procedures on a computer workstation.</p> <p>118. Discuss procedures for organizing and managing fonts on a workstation.</p> <p>119. Demonstrate font management procedures on a computer workstation.</p> <p>120. Demonstrate a file backup.</p> <p>121. Discuss disaster recovery file backup options.</p> <p>122. Describe file storage/transfer devices:</p> <ul style="list-style-type: none"> <li>a. CD Rom,</li> <li>b. DVD,</li> <li>c. flash memory (USB),</li> <li>d. tape,</li> <li>e. external hard drive,</li> <li>f. networked backup drives, and</li> <li>g. offsite cloud backup.</li> </ul> <p>123. Demonstrate the use of a file compression utility for file storage or transfer.</p> <p>124. Describe metadata.</p> <p>125. Discuss the importance of metadata in managing media files.</p> <p>126. Use metadata for digital asset management.</p> <p><b>I. Digital File Output</b></p>

Course Code	Course Name	Essential Standards
		<p>127. Describe a Raster Image Processor (RIP).</p> <p>128. Identify the features and functions of a Raster Image Processor (RIP).</p> <p>129. Compare direct to plate versus direct to press.</p> <p>130. Describe the characteristics of plate material for offset printing:</p> <ul style="list-style-type: none"> <li>a. paper,</li> <li>b. plastic, and</li> <li>c. metal.</li> </ul> <p>131. Describe the capabilities, specifications and functions of a platesetter.</p> <p>132. Demonstrate calibration of a platesetter to manufacturer's specifications.</p> <p>133. Create a flowchart of workflow steps when outputting to offset press.</p> <p>134. Create a flowchart of workflow steps when outputting to digital press.</p> <p>135. Describe print queue.</p> <p>136. Explain how print queues can be optimized by a digital press operator.</p> <p>137. Identify quality control marks:</p> <ul style="list-style-type: none"> <li>a. register marks,</li> <li>b. trim marks,</li> <li>c. fold lines,</li> <li>d. color bars, and</li> <li>e. plate control.</li> </ul> <p>138. Explain tone value increase (TVI) and its impact on printed materials.</p> <p>139. Demonstrate outputting a file to a digital device.</p> <p>140. Discuss quality control measurement devices:</p> <ul style="list-style-type: none"> <li>a. densitometer,</li> <li>b. colorimeter,</li> <li>c. plate readers, and</li> <li>d. spectrophotometer.</li> </ul> <p>141. Discuss print shop quality process control standard operating procedures (SOP).</p> <p>142. Review safety considerations when using computer-to-plate, digital production printer or digital press.</p> <p>143. Describe safety data sheets (SDS).</p> <p>144. Describe industry workflow automation guidelines:</p>

Course Code	Course Name	Essential Standards
		<p>a. International Cooperation for Integration of Processes in Prepress, Press, and Postpress (CIP4) and  b. Job Definition Format (JDF).</p> <p>145. Describe print industry specifications:  a. Web Offset Publications (SWOP),  b. Specifications for Newsprint Advertising Production (SNAP),  c. General Requirements for Applications in Commercial Offset Lithography (GRACoL), and  d. Flexographic Image Reproduction Specifications and Tolerances (FIRST).</p> <p>J. Math and Measurement</p> <p>146. Measure a Helvetica typeface in points using the appropriate measuring tools.</p> <p>147. Solve division of decimal problems—two and three digits.</p> <ul style="list-style-type: none"> <li>• Convert 30 inch length to Points.</li> <li>• Calculate monthly cost of software that is leased for \$263.00 per year.</li> </ul> <p>148. Solve decimals to percent conversion problems.</p> <ul style="list-style-type: none"> <li>• Calculate total number of blank pages in 300 page book if 84 percent are printed.</li> </ul> <p>149. Solve basic linear measurement problems.</p> <ul style="list-style-type: none"> <li>• Calculate the number of inches in a poster that is 2.4 feet long.</li> </ul>
6202 -6203		<p>C. Frame and Mesh Preparation</p> <p>Describe the use of a tension meter.</p> <p>43. Demonstrate proper use of a tension meter.</p> <p>44. Inspect the quality of a frame and mesh preparation.</p> <p>D. Stencil and Screen Preparation</p> <p>45. Specify the workflow steps used to make a screen.</p> <p>46. Describe emulsion used to make a screen (capillary, liquid and film).</p> <p>47. Explain the use of emulsion when making a screen.</p> <p>48. Choose appropriate type of emulsion for an instructor specified job.</p> <p>49. Describe requirements to prepare the screen for a stencil application.</p>

Course Code	Course Name	Essential Standards
		<p>50. Demonstrate the proper application of emulsion to the screen.</p> <p>51. Demonstrate the proper drying requirements of the screen.</p> <p>52. Demonstrate the proper steps of exposing the screen while maintaining screen to screen registration.</p> <p>53. Demonstrate the proper steps of washing image area of a screen and allowing to dry.</p> <p>54. Specify the possible defects that will affect the quality of print.</p> <p>55. Evaluate a stencil for quality defects.</p> <p>56. Demonstrate the proper step of masking a stencil for production use.</p> <p><b>E. Print Production</b></p> <p>57. List workflow steps used during printing.</p> <p>58. Demonstrate proper loading of screen onto press.</p> <p>59. Describe characteristics of Squeegees used:</p> <ul style="list-style-type: none"> <li>a. durometer,</li> <li>b. shape, and</li> <li>c. width.</li> </ul> <p>60. Demonstrate the proper choice of Squeegee for a specific job.</p> <p>61. List the types of ink used in screen-printing.</p> <p>62. Make the proper choice of ink for a specific job.</p> <p>63. Demonstrate confirmation of correct ink specifications from a job ticket.</p> <p>64. Describe the alignment of screens for proper registration.</p> <p>65. Demonstrate the proper alignment of screens for a specific job.</p> <p>66. Define flood stroke.</p> <p>67. Define print stroke.</p> <p>68. Define off contact and peel.</p> <p>69. Demonstrate the proper setting of off contact to control image quality.</p> <p>70. Demonstrate the proper application of ink to screen.</p> <p>71. Demonstrate the proper loading and alignment of substrate on press.</p> <p>72. Demonstrate the proper adjustment of Squeegee pressure for an instructor specified job.</p> <p>73. Demonstrate the proper operation of press.</p> <p>74. Determine quality control procedures to ensure print quality.</p>

Course Code	Course Name	Essential Standards
		<p>75. Determine corrective actions required to maintain quality.</p> <p>76. Describe drying systems:</p> <ol style="list-style-type: none"> <li>a. flash and</li> <li>b. conveyor.</li> </ol> <p>77. Evaluate an instructor specified finished product.</p> <p>78. Demonstrate organization or packaging of a finished product according to job ticket.</p> <p>79. Organize or package a finished product according to job specifications.</p> <p><b>F. Clean-Up Process</b></p> <p>80. Describe a safety data sheet.</p> <p>81. Explain the use of a safety data sheet.</p> <p>82. Demonstrate proper procedures when handling cleaning chemicals.</p> <p>83. List workflow steps used during cleaning.</p> <p>84. Demonstrate the proper removal, cleaning and storing of Squeegee(s).</p> <p>85. Demonstrate the proper removal of remaining ink from screen.</p> <p>86. Demonstrate the proper cleansing of screen</p> <p>87. Demonstrate the proper storage or disposal of ink as specified by local regulations.</p> <p>88. Demonstrate the proper removal of frame from a press.</p> <p>89. Demonstrate the proper preparation of screen for reuse or reclamation.</p> <p>90. Demonstrate the proper selection and use of appropriate chemistry and washout equipment to remove stencil.</p> <p>91. List possible defects in a screen.</p> <p>92. Describe strategies for reuse of screen.</p> <p>93. Demonstrate the proper chemical or mechanical adjustments to screen for reuse.</p> <p>94. Demonstrate the proper storage of screen.</p> <p>95. Demonstrate proper cleaning of additional auxiliary equipment.</p> <p>96. Assess the cleanup activities completed within shop.</p>
<b>Media Technology</b>		
6124	Media Technology 1	C. Technology Knowledge

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> </ol> <p><b>G. Demonstrating Production Practices</b></p> <ol style="list-style-type: none"> <li>1. Identify parts of and operate a camera.</li> <li>2. Set up and utilize camera supports and mounts effectively.</li> <li>3. Compose shots following basic composition guidelines (rule of thirds, lead/talk space, framing, title/action safe areas, etc.).</li> <li>4. Adjust a camera, including setting gain, filters, aperture, focus, and white balance.</li> </ol> <p><b>H. Demonstrating Post-Production Practices</b></p> <ol style="list-style-type: none"> <li>1. Identify basic functions and resources for editing audio and video productions.</li> <li>2. Manage production assets effectively.</li> </ol> <p><b>I. Understanding Employability in the Media Technology Field</b></p> <ol style="list-style-type: none"> <li>1. Evaluate media technology industries, organizations, and careers based on multiple sources of research and information.</li> <li>2. Assess interest areas to determine potential career pathways, including career ladders.</li> <li>3. Identify performance-based characteristics needed to obtain jobs in media technology.</li> <li>4. Identify sources of information on media careers.</li> </ol>
6125	Media Technology 2	<p><b>C. Technology Knowledge</b></p> <ol style="list-style-type: none"> <li>1. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment)</li> </ol> <p><b>F. Demonstrating Pre-Production Practices</b></p> <ol style="list-style-type: none"> <li>1. Define relevant media technology pre-production nomenclature.</li> <li>2. Demonstrate the various forms of script writing.</li> <li>3. Explain the differences between field and studio production environments.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>4. Explain characteristics of newsworthiness.</p> <p>G. Demonstrating Production Practices</p> <ol style="list-style-type: none"> <li>1. Identify parts of and operate a camera.</li> <li>2. Set up and utilize camera supports and mounts effectively.</li> <li>3. Compose shots following basic composition guidelines (rule of thirds, lead/talk space, framing, title/action safe areas, etc.).</li> <li>4. Adjust a camera, including setting gain, filters, aperture, focus, and white balance.</li> </ol> <p>H. Demonstrating Post-Production Practices</p> <ol style="list-style-type: none"> <li>1. Identify basic functions and resources for editing audio and video productions.</li> <li>2. Manage production assets effectively</li> </ol> <p>I. Understanding Employability in the Media Technology Field</p> <ol style="list-style-type: none"> <li>4. Evaluate media technology industries, organizations, and careers based on multiple sources of research and information.</li> <li>5. Demonstrate the entry-level requirements for media-related careers.</li> <li>6. Describe the roles of advertising and sales in the media industry.</li> </ol> <p>J. Applying Legal Requirements and Ethical Considerations to Business Practices and Decisions</p> <ol style="list-style-type: none"> <li>1. Identify laws that regulate businesses and organizations in media technology.</li> <li>2. Discuss the evolving nature of copyright and trademark laws.</li> <li>3. Discuss copyright infringement and fair use exemptions</li> </ol>
6126	Media Technology 3	<p>C. Technology Knowledge</p> <ol style="list-style-type: none"> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> <li>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</li> </ol> <p>F. Demonstrating Pre-Production Practices</p> <ol style="list-style-type: none"> <li>11. Determine budget requirements.</li> <li>12. Design creative elements of production to include lighting, sound, props, effects, and talent.</li> <li>13. Schedule project workflow effectively and create a production schedule.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>14. State the importance of obtaining approval/sign-off</p> <p>G. Demonstrating Production Practices</p> <p>16. Explain the importance of nat/ambient sound and incorporate in a production.</p> <p>17. Explain the importance of shooting for the edit.</p> <p>18. Manage crew and cast required for a production.</p> <p>19. Shoot/record a production script.</p> <p>20. Monitor, review, and adjust a production schedule.</p> <p>H. Demonstrating Post-Production Practices</p> <p>8. Utilize critiques and peer reviews to evaluate projects, including a respect for peers' work and the ability to give and receive constructive criticism, using rubrics.</p> <p>9. Define codec and file formats and give common uses of each.</p> <p>10. Demonstrate procedures that prepare productions for publishing/distribution.</p> <p>I. Understanding Employability In The Media Technology Field</p> <p>9. Explain project-based client management and chain of command.</p> <p>10. Create professional materials: digital portfolio and/or demo reel, resume, and credential/certification if applicable.</p> <p>11. Maintain a professional online presence including, but not limited to, gamer tags, avatars, e-mail addresses, and social media content.</p> <p>J. Applying Legal Requirements and Ethical Considerations to Business Practices and Decisions</p> <p>7. Describe the intent of the term "public trust" as it pertains to a media business.</p> <p>8. Describe the influence of government regulations on media.</p> <p>9. Demonstrate an understanding of bias in the media</p> <p>K. Analyzing the History and Evolution of Media Technology in the Arts and Society</p> <p>3. Identify key local and national issues for arts and communications technologies.</p> <p>4. Predict future trends related to media technology.</p>
6127	Media Technology 4	<p>C. Technology Knowledge</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p>

Course Code	Course Name	Essential Standards
		<p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p><b>F. Demonstrating Pre-Production Practices</b>  11. Determine budget requirements.  12. Design creative elements of production to include lighting, sound, props, effects, and talent  13. Schedule project workflow effectively and create a production schedule.  14. State the importance of obtaining approval/sign-off</p> <p><b>G. Demonstrating Production Practices</b>  16. Explain the importance of nat/ambient sound and incorporate in a production.  17. Explain the importance of shooting for the edit.  18. Manage crew and cast required for a production.  19. Shoot/record a production script.  20. Monitor, review, and adjust a production schedule.</p> <p><b>H. Demonstrating Post-Production Practices</b>  8. Utilize critiques and peer reviews to evaluate projects, including a respect for peers’ work and the ability to give and receive constructive criticism, using rubrics.  9. Define codec and file formats and give common uses of each.  10. Demonstrate procedures that prepare productions for publishing/distribution.</p> <p><b>I. Understanding Employability in the Media Technology Field</b>  9. Explain project-based client management and chain of command.  10. Create professional materials: digital portfolio and/or demo reel, resume, and credential/certification if applicable.  11. Maintain a professional online presence including, but not limited to, gamer tags, avatars, e-mail addresses, and social media content.</p> <p><b>J. Applying Legal Requirements and Ethical Considerations to Business Practices and Decisions</b>  7. Describe the intent of the term “public trust” as it pertains to a media business.  8. Describe the influence of government regulations on media.  9. Demonstrate an understanding of bias in the media</p>

Course Code	Course Name	Essential Standards
		K. Analyzing the History and Evolution of Media Technology in the Arts and Society 3. Identify key local and national issues for arts and communications technologies. 4. Predict future trends related to media technology.
<b>Architecture/Mechanical Design</b>		
6170	Architectural Design 1	C. Technology Knowledge 1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation (e.g., keying speed). 2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes. 3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.  F. Introduction to Drafting Techniques 1. Identify alphabet of lines to include line weight (thickness). 2. Create multi-view drawings. 3. Utilize hand-lettering techniques to neatly add notes and/or dimensions to sketches. 4. Demonstrate measuring skills using various tools, including an engineering scale.  G. Demonstrate Cad-Specific Skills 1. Identify and utilize elements of the graphical user interface (e.g., ribbon, panels, command line, drop-down menus, and toolbars). 2. Identify the use of various file formats (e.g., .dwg, .dxf, .dwt, and .bak). 3. Import and export various data files between formats. 4. Open and save various file types in a structured directory. 5. Perform drawing setup to applicable standards (e.g., setting layers, line type, and line weight). 6. Identify and use display commands (e.g., zoom and pan). 7. Draw geometric components using straight and curved lines. 8. Create and modify borderlines and title block.  H. Demonstrate Architectural Design Skills 1. Draw floor plans. 2. Draw foundation plans. 3. Set and control dimensioning styles.

Course Code	Course Name	Essential Standards
		<p>4. Dimension various types of architectural plans and details.</p> <p>5. Prepare a window and/or door schedule.</p>
6171	Architectural Design 2	<p>C. Technology Knowledge</p> <p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p>8. Evaluate various solutions to common hardware and software problems.</p> <p>G. Demonstrate CAD-Specific Skills</p> <p>9. Modify geometric components (e.g., copy, trim, scale, and stretch).</p> <p>10. Modify geometric properties (e.g., layer, color, line weight, and type).</p> <p>11. Use inquiry commands to extract drawing data (e.g., list, distance, and area).</p> <p>12. Annotate drawings to include text and dimensions.</p> <p>13. Create, retrieve, edit, and use symbol libraries.</p> <p>14. Utilize paper space and create viewports.</p> <p>15. Plot/Print drawing to appropriate scale.</p> <p>16. Use software help features</p> <p>H. Demonstrate Architectural Design Skills</p> <p>6. Draw exterior elevations.</p> <p>7. Draw interior elevations.</p> <p>8. Draw roof plans.</p> <p>9. Draw various foundation sections (e.g. foundation, floor, wall, or stairs).</p> <p>10. Apply standard building codes to architectural plans.</p>
6172	Mechanical Design 1	<p>C. Technology Knowledge</p> <p>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation (e.g., keying speed).</p> <p>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</p>

Course Code	Course Name	Essential Standards
		<p>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</p> <p>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., cyber bullying; piracy; illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</p> <p><b>F. Introduction to Drafting Techniques</b></p> <ol style="list-style-type: none"> <li>1. Identify alphabet of lines to include line weight (thickness).</li> <li>2. Create orthographic drawings.</li> <li>3. Utilize hand-lettering techniques to neatly add notes and/or dimensions to sketches.</li> <li>4. Demonstrate measuring skills using various tools, including an engineering scale.</li> </ol> <p><b>G. Demonstrate Cad-Specific Skills</b></p> <ol style="list-style-type: none"> <li>1. Identify and utilize elements of the graphical user interface (e.g., ribbon, panels, command line, drop-down menus, and toolbars).</li> <li>2. Identify the use of various file formats (e.g., .dwg, .dxf, .dwt, and .bak).</li> <li>3. Import and export various data files between formats.</li> <li>4. Open and save various file types in a structured directory.</li> <li>5. Perform drawing setup to applicable standards (e.g., setting layers, line type, and line weight).</li> <li>6. Identify and use display commands (e.g., zoom and pan).</li> <li>7. Draw geometric components using straight and curved lines.</li> <li>8. Create and modify borderlines and title block</li> </ol> <p><b>H. Demonstrate Geometric Construction Skills (Standard and Metric)</b></p> <ol style="list-style-type: none"> <li>1. Draw straight and parallel lines.</li> <li>2. Draw tangent lines, arcs, circles, and curves.</li> <li>3. Draw regular polygons, circles, and ellipses</li> <li>4. Bisect lines, arcs, and angles.</li> <li>5. Divide lines and circles equally</li> </ol> <p><b>I. Demonstrate Dimensioning Skills (Standard and Metric)</b></p>

Course Code	Course Name	Essential Standards
		<p>1. Set and control dimensioning styles.  2. Dimension using aligned and unidirectional dimensioning systems.  3. Dimension using leaders for notes, arcs, and circular features</p> <p>J. Demonstrate Orthographic Projections (Standard and Metric)  1. Draw regular orthographic views.  2. Draw regular, inclined, and oblique surfaces.  3. Draw curved surfaces.  4. Draw surface intersections.</p> <p>K. Demonstrate Skills and Knowledge Required to Produce Technical Illustrations (Standard and Metric)  1. Draw an isometric projection</p> <p>L. Demonstrate Knowledge and Skills Required to Produce Sectional Views and Applying Standard Conventional Design Practices  1. Demonstrate section line and symbol techniques.  2. Identify various types of sectional views.</p> <p>M. Demonstrate Knowledge and Skills Required to Produce Auxiliary Views  1. Demonstrate the ability to rotate a point, a line, and a surface.</p>
6173	Mechanical Design 2	<p>C. Technology Knowledge  5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.  6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.  7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.  8. Evaluate various solutions to common hardware and software problems.</p>

Course Code	Course Name	Essential Standards
		<p>G. Demonstrate CAD-Specific Skills</p> <ol style="list-style-type: none"> <li>9. Modify geometric components (e.g., copy, trim, scale, and stretch).</li> <li>10. Modify geometric properties (e.g., layer, color, line weight, and type).</li> <li>11. Use inquiry commands to extract drawing data (e.g., list, distance, and area).</li> <li>12. Annotate drawings to include text and dimensions.</li> <li>13. Create, retrieve, edit, and use symbol libraries.</li> <li>14. Utilize paper space and create viewports.</li> <li>15. Plot/Print drawing to appropriate scale</li> <li>16. Use software help features</li> </ol> <p>H. Demonstrate Geometric Construction Skills (Standard and Metric)</p> <ol style="list-style-type: none"> <li>1. Draw straight and parallel lines.</li> <li>2. Draw tangent lines, arcs, circles, and curves.</li> <li>3. Draw regular polygons, circles, and ellipses.</li> <li>4. Bisect lines, arcs, and angles.</li> <li>5. Divide lines and circles equally.</li> </ol> <p>I. Demonstrate Dimensioning Skills (Standard and Metric)</p> <ol style="list-style-type: none"> <li>4. Dimension using dual dimensioning skills (standard and metric).</li> <li>5. Dimension using tolerances.</li> <li>6. Identify and apply geometric dimensions and tolerances</li> </ol> <p>J. Demonstrate Orthographic Projections (Standard and Metric)</p> <ol style="list-style-type: none"> <li>4. Draw surface intersections.</li> <li>5. Draw detailed size description.</li> <li>6. Identify 1st- and 3rd-angle projection drawings.</li> <li>7. Draw a 3rd-angle projection drawing</li> </ol> <p>K. Demonstrate Skills and Knowledge Required to Produce Technical Illustrations (Standard and Metric)</p> <ol style="list-style-type: none"> <li>2. Draw an isometric section.</li> <li>3. Draw an oblique projection</li> </ol> <p>L. Demonstrate Knowledge and Skills Required to Produce Sectional Views and Applying Standard Conventional Design Practices</p>

Course Code	Course Name	Essential Standards
		<p>3. Draw half and full sections. 4. Draw broken-out sections</p> <p>M. Demonstrate Knowledge and Skills Required to Produce Auxiliary Views 1. Demonstrate the ability to rotate a point, a line, and a surface. 2. Demonstrate the ability to determine the true length of a line. 3. Draw a primary auxiliary view.</p> <p>N. Demonstrate Knowledge and Skills Required to Produce Detailed Machine Drawings 1. Devise proper order fulfillment and delivery methods. 2. Describe the impact of branding on customer loyalty. 3. Create and promote a program to maintain customer/client goodwill and loyalty. 4. Create and conduct a customer survey. 5. Create client file using appropriate software. 6. Prepare sales reports. 7. Create policies to handle customer complaints and concerns. 8. Using a CTSO scoring rubric for Professional Sales, evaluate the overall sales process.</p>

## Business Management and Administration Cluster

Course Code	Course Name	Essential Standards
5122	Administrative Support Technology	F. Administrative Support Functions G. Document Preparation H. Meeting Preparation and Equipment use I. Business Communication M. Financial Functions N. Management O. Management and Leadership Styles P. Career Development
5049	Advanced Business Law	F. Principles of Law G. Legal Systems J. Business Organization L. Consumer Protection Law M. Real and Personal Property Laws N. Employment Law O. Domestic and Personal Law
5044	Business Law	F. Principles of Law G. Legal Systems H. Civil and Criminal Law I. Procedural and Substantive Law K. Contract Law P. Computer Law Q. Career Exploration
5092	Business Principles and Management	F. Characteristics of Business G. Social and Ethical Environment of Business H. Economic Environment of Business

Course Code	Course Name	Essential Standards
		I. International Environment of Business J. Forms of Business K. Legal Aspects of Business L. Organizational Communications M. Management Functions and Decision Making N. The Manager as Leader O. The Planning Function R. Career Development
5176	Digital Publication Design	F. Introduction to Computer Illustration and Design G. Design & Layout Principles H. Digital Imaging I. Creating Publications J. Proofreading K. Career & Portfolio Development
5030	Digital Multimedia	F. Introduction to Multimedia G. Multimedia Design Process H. Visual Design Practices I. Images and Graphics L. 2-D Animation M. 3-D Animation/Game Design P. Multimedia Project Q. Web Resources R. Careers
5180	Digital Technologies	F. Exploring Digital Technologies G. Speech Recognition: Preparing to Use the Tools H. Speech Recognition: Using Basic Techniques J. Mobile Devices: Introduction O. Using Presentations to Communicate

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>P. Desktop Publishing</li> <li>R. Collaboration Skills</li> <li>S. Project Based Learning: Using Digital Technology</li> <li>U. Careers</li> </ul>
5400	Entrepreneurship	<ul style="list-style-type: none"> <li>F. Characteristics of Entrepreneurs</li> <li>G. Forms of Business Ownership</li> <li>H. Financing a Business</li> <li>I. Business Economics</li> <li>N. Business Plan</li> </ul>
5090	Fundamentals of Business, Marketing and Finance	<ul style="list-style-type: none"> <li>F. Economic Fundamentals</li> <li>G. Business and Operations Management</li> <li>H. International Business</li> <li>I. Entrepreneurship</li> <li>J. Financial Planning</li> <li>M. Information Technology</li> <li>O. Marketing Fundamentals</li> <li>P. Merchandising Fundamentals</li> <li>Q. Career Development</li> </ul>
5093	Fundamentals of Human Resource Management	<ul style="list-style-type: none"> <li>F. Introduction to Human Resource Management</li> <li>G. Legal Issues in Human Resources Management</li> <li>K. Compensation and Benefits</li> <li>L. Development and Evaluation</li> <li>M. Workplace Safety and Health</li> <li>N. Employee-Management Relations</li> <li>O. Human Resource Management Careers</li> </ul>

Course Code	Course Name	Essential Standards
5480	Fundamentals of Project Management	F. Professional Development G. Project Management Fundamentals H. Initiate Projects I. Planning Projects J. Executing Projects K. Monitor and Control Projects
5032	Global Business	F. Foundations G. Multiculturalism H. Global Economy I. International Travel J. Cultural Influences K. Government and Trade Relations M. Importing and Exporting N. Global Financial Market P. Global Marketing and Consumer Behavior Q. Career Opportunities
5007	Google Applications	F. Google Search and Google Chrome G. Gmail I. Google Drive Fundamentals J. Google Docs K. Google Sheets L. Google Slides M. Google Sites N. Google Earth O. Google Maps P. You Tube Q. Google Hangouts R. Google Forms X. Project/Simulation Learning

<b>Course Code</b>	<b>Course Name</b>	<b>Essential Standards</b>
5340	Image Editing	F. Design Principles G. Design Elements H. Understanding Image Editing Tools and Workspace I. Creating & Manipulating Images J. Publishing Images K. Career Development
5020	Integrated Business Applications 1	F. Word G. Excel H. PowerPoint
5021	Integrated Business Applications 2	G. Advanced Excel H. Access I. Advanced PowerPoint
5270	Principles of Digital Technology	F. Computing Fundamentals G. Key Applications H. Living Online
5178	Professional and Leadership Development	F. Understanding Leadership and Team Dynamics G. Effective Communication H. Goal Setting I. Managing Time and Resources K. Citizenship and Community Service L. Professional Preparation
5150	Virtual Enterprise 1	F. Professional Development and Career Readiness H. Strategic Management

Course Code	Course Name	Essential Standards
		I. Operations Management K. Business Structures and the Law P. Personal Financial Management
5151	Virtual Enterprise 2	F. Professional Development and Career Readiness G. Economics H. Strategic Management I. Operations Management J. Business Financial Management
5152	Virtual Enterprise 3	F. Professional Development and Career Readiness L. Human Resource Management M. Information Technology Management N. Marketing Management
5153	Virtual Enterprise 4	L. Human Resource Management M. Information Technology Management O. Insurance and Risk Management P. Personal Financial Management
5041	Workplace Communications	F. The Communication Process G. Reading for a Purpose H. Listening for a Purpose I. Writing for a Purpose J. Researching for a Purpose K. Speaking for a Purpose L. Social Communication M. Employment Communications-Capstone

## Education and Training Cluster

Course Code	Course Name	Essential Standards
5800	Child Development 1	<p>B1. Analyze parenting roles and responsibilities.</p> <p>C1. Identify characteristics of prenatal care, pregnancy, and childbirth.</p> <p>D1. Analyze the stages of human growth and development during infancy and toddlerhood.</p> <p>E1. Examine issues related to the health and safety of children.</p> <p>F1. Explore early childhood career options and employability skills.</p>
5801	Child Development 2	<p>B1. Analyze the stages of growth and development during early childhood.</p> <p>C1. Analyze practices that promote the health and safety of children.</p> <p>D1. Evaluate techniques for positive collaborative relationships.</p> <p>E1. Evaluate childcare agencies and services.</p> <p>F1. Demonstrate professional practices, ethics, and standards related to working with children.</p>
<b>Early Childhood Education</b>		
5702	Introduction to Early Childhood Education	<p>B1. Analyze the characteristics, requirements, and roles of early childhood professionals.</p> <p>C1. Analyze the domains of development.</p> <p>D1. Identify safe and healthy practices when working with children.</p> <p>E1. Evaluate techniques for establishing and maintaining positive collaborative relationships.</p>
5700	Early Childhood Education 1	<p>B1. Analyze education and training requirements and opportunities for early childhood career paths.</p> <p>C1. Analyze effective strategies and available resources for each domain of early childhood development.</p> <p>D1. Evaluate developmentally appropriate lessons for content areas.</p>

Course Code	Course Name	Essential Standards
		E1. Evaluate learning environments and activities to ensure safe, sanitary, and healthy practices. F1. Model effective collaborative relationship skills.
5701	Early Childhood Education 2	B1. Analyze education and training requirements and opportunities for early childhood career paths. C1. Analyze effective strategies and available resources for each domain of early childhood development. D1. Evaluate developmentally appropriate lessons for content areas. E1. Evaluate learning environments and activities to ensure safe, sanitary, and healthy practices. F1. Model effective collaborative relationship skills.
<b>Introduction to Teaching</b>		
5703	Introduction to Teaching 1	B1. Analyze professional practices, ethics, and standards related to education careers. C1. Examine the historical and contemporary significance of education. D1. Analyze the principles of human growth and development. E1. Evaluate environments to determine safety and healthy factors. F1. Demonstrate techniques to development and maintain positive collaborative relationships.
5704	Introduction to Teaching 2	B1. Analyze professional practices, ethics, and standards related to education careers. C1. Design learning environments that encourage and support student learning. D1. Develop best practice teaching strategies for diverse learners. E1. Engage in extended learning opportunities for professional experiences.

## Finance Cluster

Course Code	Course Name	Essential Standards
5001	Accounting 1	F. Accounting Cycle G. Cash Control System I. Careers in Accounting
5005	Accounting 2	F. Accounting Cycle G. Current Assets H. Plant Assets, I. Liabilities J. Stockholders' Equity K. End-of-Period Accounting L. Payroll Systems
5271	Banking Services	F. Introduction to Banking G. Legislation and Regulation of Banking H. Deposits I. Money and Interest K. Bank Loans L. Mortgages M. Specialized Bank Services O. Security and Ethics P. Diverse Careers in Banking Services
5273	Business Finance	F. Financial Fundamentals G. Financial Environment of Business H. Financial Markets I. Financial Management Planning J. Financial Management Analysis

Course Code	Course Name	Essential Standards
		L. Long-Term Strategic Planning Q. Data Protection S. Professionalism
5275	Insurance and Risk Management	F. Insurance and Risk Management Basics G. Automobile Insurance H. Liability Insurance I. Renters and Homeowner's Insurance J. Commercial Insurance K. Claims L. Health Insurance P. Professional Development and Licensing Preparation
5131	Personal Finance	F. Careers and Income G. Budgeting and Financial Planning H. Banking Services I. Checking and Savings Account J. Credit and Debt K. Credit and Loans M. Independent Living O. Financial Responsibility and Decision Making P. Investments
5277	Securities and Investments	F. Financial Regulations G. Ethics H. Financial Planning for Life I. Investment Power J. Stock Investments K. Bond Investments L. Mutual Funds M. Other Investment Options

Course Code	Course Name	Essential Standards
		Q. Careers in Investing

## Government and Public Administration Cluster

Course Code	Course Name	Essential Standards
6570	Foundations of Leadership	<p>"This is a new course under the Government and Public Administration cluster. Pre/Post Assessments are provided by Precision Exams. Employability assessment are provided by either Microburst EmployABILITY skills or SkillsUSA Career Essentials. These standards are still in development. Standards listed are essential for the student to understand Foundations of Leadership.</p> <p><b>A. SAFETY</b></p> <ol style="list-style-type: none"> <li>1. Review school safety policies and procedures.</li> <li>2. Review classroom safety rules and procedures.</li> <li>3. Review safety procedures for using equipment in the classroom.</li> <li>4. Identify major causes of work-related accidents in office environments.</li> <li>5. Demonstrate safety skills in an office/work environment.</li> </ol> <p><b>B. STUDENT ORGANIZATIONS</b></p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technical Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p><b>C. TECHNOLOGY KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; illegal downloading; cyberbullying; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> </ol>

		<p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, Creative Commons, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p><b>D. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate punctuality.</li> <li>2. Demonstrate self-representation.</li> <li>3. Demonstrate work ethic.</li> <li>4. Demonstrate respect.</li> <li>5. Demonstrate time management.</li> <li>6. Demonstrate integrity.</li> <li>7. Demonstrate leadership.</li> <li>8. Demonstrate teamwork and collaboration.</li> <li>9. Demonstrate conflict resolution.</li> <li>10. Demonstrate perseverance.</li> <li>11. Demonstrate commitment.</li> <li>12. Demonstrate a healthy view of competition.</li> <li>13. Demonstrate a global perspective.</li> <li>14. Demonstrate health and fitness.</li> <li>15. Demonstrate self-direction.</li> <li>16. Demonstrate lifelong learning.</li> </ol> <p><b>E. PROFESSIONAL KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> </ol>
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		<p>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</p> <p>10. Demonstrate diversity awareness.</p> <p>11. Demonstrate job acquisition and advancement skills.</p> <p>12. Demonstrate task management skills.</p> <p>13. Demonstrate customer-service skills.</p> <p><b>F. LEADERSHIP AND TEAM DYNAMICS</b></p> <p>1. Identify the different personality types to include an inventory (MBTI, True Colors, etc.).</p> <p>2. Define principles of ethical leadership and their impact on team dynamics.</p> <p>3. Compare and contrast the differences between a leader and a manager, including communication styles.</p> <p>4. Compare and contrast behavioral (e.g., collaborative, direct, decision- maker) and classical leadership (e.g., democratic, autocratic, and laissez-faire) styles.</p> <p>5. Identify and describe effective and non-effective leadership characteristics.</p> <p>6. Formulate strategies for resolving conflict (e.g., competing, accommodating, avoiding, collaborating, and compromising).</p> <p>7. Analyze the stages of team development (i.e., forming, storming, norming, and performing).</p> <p>8. Evaluate internal and external motivation, and the role of incentives.</p> <p>9. Identify examples of equity/access/bias issues.</p> <p>10. Analyze the impact of social media on leaders, teams, and society.</p> <p>11. Demonstrate team-building skills.</p> <p><b>G. EFFECTIVE COMMUNICATION</b></p> <p>1. Identify various forms of communication (visual, verbal, and digital).</p> <p>2. Discuss the steps involved in communication (thinking, encoding, transmitting, receiving, and decoding).</p> <p>3. Compare and contrast the four basic styles of communication.</p> <p>4. Describe nonverbal and verbal communication techniques.</p> <p>5. Demonstrate appropriate communication etiquette.</p> <p>6. Demonstrate effective listening skills.</p> <p>7. Apply the five C's of effective communication skills to all communications.</p> <p><b>H. GOAL SETTING</b></p> <p>1. Establish and articulate personal and organizational vision, mission, goals, and objectives.</p>
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		<ol style="list-style-type: none"> <li>2. Align vision, mission, goals, and objectives to an organization’s strategic plan.</li> <li>3. Discuss the need for short-, intermediate, and long-term goals in an organization, business, or a government entity.</li> <li>4. Develop and evaluate specific, measurable, attainable, realistic, time- bound (SMART) personal and/or organizational short-, intermediate, and long-terms.</li> </ol> <p><b>I. MANAGING TIME AND RESOURCES</b></p> <ol style="list-style-type: none"> <li>1. Explain effective time management skills and practices.</li> <li>2. Discuss the importance of prioritizing personal and professional responsibilities.</li> <li>3. Describe techniques for managing stress and maintaining balance in the school/workplace environment.</li> <li>4. Define delegation and identify the process.</li> <li>5. Explain human resource management functions, (e.g., recruitment, labor law compliance, training/orientation, retention, and performance evaluation).</li> <li>6. Analyze the impact of diversity, globalization, and culture in resource management.</li> <li>7. Create financial budgets for organization, projects, and activities.</li> <li>8. Develop a plan to manage business resources.</li> </ol> <p><b>J. MEETING MANAGEMENT AND PROCEDURES</b></p> <ol style="list-style-type: none"> <li>1. Identify types and purposes of meetings (e.g., open, closed, public, and private).</li> <li>2. Explain meeting requirements under Freedom of Information Act (FOIA) in respect to meetings, including notices, agendas, vote records, minutes, and public participation.</li> <li>3. Demonstrate proper parliamentary procedure/meeting etiquette.</li> <li>4. Identify the different roles of officers and members when conducting a meeting.</li> <li>5. Identify proper methods to document and record meetings.</li> <li>6. Conduct a meeting and record the minutes.</li> </ol> <p><b>K. CITIZENSHIP AND COMMUNITY INVESTMENT</b></p> <ol style="list-style-type: none"> <li>1. Identify personal responsibility to school, organization, and community stakeholders.</li> <li>2. Identify personal character traits of a student as a responsible school, organization, and community leader (e.g., honesty, respect, accountability, etc.)</li> <li>3. Identify the civic needs (from a benefit/value perspective) of the school, a non-profit organization, and/or the community.</li> <li>4. Construct a comparative cost/benefit analysis of various proposed projects.</li> <li>5. Select, plan, budget, implement, evaluate, and present a community service project for a school, a non-profit organization, and/or the community.</li> </ol>
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		<p><b>L. PERSONAL AND PROFESSIONAL BRAND</b></p> <ol style="list-style-type: none"> <li>1. Justify how personal and professional memberships in professional organizations impact personal branding.</li> <li>2. Analyze various digital media (e.g., social media, videography, and photography) applications that impact future opportunities.</li> <li>3. Create and/or update resume based on experiences.</li> <li>4. Prepare, participate, and follow-up in an interview process.</li> </ol>
6571	Principles of Public Management and Administration	<p>"This is a new course under the Government and Public Administration cluster. Pre/Post Assessments are provided by Precision Exams. Employability assessment are provided by either Microburst EmployABILITY skills or SkillsUSA Career Essentials. These standards are still in development. Standards listed are essential for the student to understand Public Management and Administration.</p> <p>PPMA 1.1 Differentiate theories of public management and administration.</p> <p>PPMA 1.2 Define and differentiate between public goods and services (e.g., national resources, national defense, and other public goods) and private goods and services (clothing, cars, and similar goods typically considered to be private in nature).</p> <p>PPMA 1.3 Investigate theories as to why the government or the private sector is better suited to provide specific goods or services.</p> <p>PPMA 1.4 Determine cause and effect of privatization of goods and services. Use supporting evidence to compose an argument for or against privatization of government goods or services with regard to efficiency, ethics, and economics.</p> <p>PPMA 2.1 Research and outline philosophies of government stewardship in public management and administration.</p> <p>PPMA 2.2 Defend an argument that public administration systems/agencies of government are designed to administer laws and policies developed through the legislative or executive branches of government.</p> <p>PPMA 2.3 Compare and contrast organizational similarities and differences among national, state, and local governmental and public administrative systems/agencies and private sector providers.</p> <p>PPMA 3.1 Compare and contrast the rights and duties of citizens at the local,</p>

		<p>state, and national levels by consulting specific government legislation and related texts.</p> <p>PPMA 3.2 Differentiate the terms: laws, policy, governance, regulation, domestic policy, and foreign policy.</p> <p>PPMA 3.3 Cite examples of how civil disobedience has influenced policy making in the U.S.</p> <p>PPMA 3.4 Identify assumptions, purpose, outcomes/solutions, and communication techniques from government agencies in relation to both historical and contemporary issues.</p> <p>PPMA 4.1 Design a postsecondary career plan in a field of public management and administration.</p> <p>PPMA 4.2 Using data from a career exploration assessment, analyze personal results to a field in public management and administration.</p> <p>PPMA 4.3 Demonstrate the application of professional practices and skills specific to government and public administration workplaces.</p> <p>PPMA 4.4 Identify and consider the common elements of a strategic plan such as mission statement, vision statement, goals, objectives, strategies, performance measures, and timeline.</p>
6572	Community and Regional Planning	<p>This is a new course under the Government and Public Administration cluster. Pre/Post Assessments are provided by Precision Exams. Employability assessments are provided by either Microburst EmployABILITY skills or SkillsUSA Career Essentials. These standards are still in development. Standards listed are essential for the student to understand Community and Regional Planning.</p> <p>CRP 1.1 Identify contributions of civilizations to modern urban planning.</p> <p>CRP 1.2 Name key inventors and contributors to modern urban planning.</p> <p>CRP 2.1 Identify planning theories.</p> <p>CRP 2.2 Synthesize theories to develop your own urban plan.</p> <p>CRP 3.1 Define and explain the sub-disciplines of urban planning.</p> <p>CRP 3.2 Compare the interrelationships among sub-discipline.</p> <p>CRP 3.3 Identify techniques used in urban planning.</p> <p>CRP 4.1 Define GIS and list its capabilities.</p> <p>CRP 4.2 Explain the uses GIS.</p>

		CRP 4.3 Demonstrate uses of GIS.
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## Health Science Cluster

Course Code	Course Name	Essential Standards	Objectives
<b>Health Science</b>			
5550	Health Science 1-Foundations of Healthcare Professions	1. Academic Foundation	1. Describe healthcare history and medical advances
		3. Systems	1. Identify and compare healthcare delivery systems
		4. Employability Skills	1. Identify personal traits/attitudes for a career-ready member of the HealthCare team. 2. Identify employability skills for career ready member of the HC Team. 3. Compare careers within the HC Career Pathways.
		7. Safety Practices	1. Identify major classifications of the microorganisms and the chain of infection. 2. Demonstrate infection control principles. 3. Apply techniques pertaining to personal safety and environmental safety. 4. Practice fire safety related to the healthcare setting.
		9. Health Maintenance	1. Apply behaviors that promote health and wellness.
		<i>Vital Signs ~ would be nice to have this foundation, but taught thoroughly in HS-2</i>	

Course Code	Course Name	Essential Standards	Objectives
5551	Health Science 2-Advanced Healthcare Application	1. Academic Foundation	1. Demonstrate competency in basic math skills and conversions as they relate to HC. 2. Identify and understand the basic structural and functional organization of the human body (tissue, organ and system).
		2. Communication	1. Report subjective and objective information
		3. Systems	1. Discuss common methods of payment for HC
		5. Legal Responsibilities	1. Explain practices that may result in mal-practice, liability, etc. scope of practice.
		<i>A strong foundation must be established in HS-2 (not taught in HS-1) Legal Responsibilities are usually one of the lowest scoring areas on NCHSE and certification exams. They are only taught briefly in Clinical Study programs due to work-based learning/clinical rotations.</i>	
		7. Safety Practices	1. Differentiate methods of controlling the spread of infection (transmission-based precautions). 2. Apply principles of body mechanics and patient safety during transfers, ambulation and positioning.
		10. Technical Skills	1. Demonstrate procedures for measuring and recording vital signs. 2. Apply skills to obtain BLS.
5552	Health Science - Human Structure, Function and Disease	1. Academic foundations	1. Identify basic levels of organization of the human body. a. Chemical b. Cellular c. Tissue d. Organs e. Systems f. Organism 2. Identify body planes, directional terms, cavities, and quadrants.

Course Code	Course Name	Essential Standards	Objectives
			<ul style="list-style-type: none"> <li>a. Body planes (sagittal, mid-sagittal, coronal/frontal, transverse/horizontal).</li> <li>b. Directional terms (superior, inferior, anterior/ventral, posterior/dorsal, medial, lateral, proximal, distal, superficial, and deep).</li> <li>c. Cavities (dorsal, cranial, spinal, thoracic, abdominal, and pelvic).</li> <li>d. Quadrants (upper right, lower right, upper left, and lower left)</li> <li>3. Analyze basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive). <ul style="list-style-type: none"> <li>a. Skeletal (bone anatomy, axial and appendicular skeletal bones, functions of bones, ligaments, types of joints)</li> <li>b. Muscular (microscopic anatomy of muscle tissue, types of muscle, locations of skeletal muscles, functions of muscles, tendons, directional movements)</li> <li>c. Integumentary (layers, structures and functions of skin)</li> <li>d. Cardiovascular (components of blood, structures and functions of blood components, structures and functions of the cardiovascular system, conduction system of the heart, cardiac cycle)</li> <li>e. Lymphatic (structures and functions of lymphatic system, movement of lymph fluid)</li> <li>f. Respiratory (structures and functions of respiratory system, physiology of respiration)</li> <li>g. Nervous (structures and functions of nervous tissue and system, organization of nervous system)</li> <li>h. Special senses (structures and functions of eye, ear, nose and tongue; identify senses for sight, hearing, smell, taste, touch)</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards	Objectives
			<ul style="list-style-type: none"> <li>i. Endocrine (endocrine versus exocrine, structures and functions of endocrine system, hormones, regulation of hormones)</li> <li>j. Digestive (structures and functions of gastrointestinal tract, chemical and mechanical digestion, structures and functions of accessory organs)</li> <li>k. Urinary (structures and functions of urinary system, gross and microscopic anatomy, process of urine formation, urine composition, homeostatic balance)</li> <li>l. Reproductive (structures and functions of male and female reproductive systems, formation of gametes, hormone production and effects, menstrual cycle, and conception)</li> <li>4. Describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers). <ul style="list-style-type: none"> <li>a. Etiology</li> <li>b. Pathology</li> <li>c. Diagnosis</li> <li>d. Treatment</li> <li>e. Prevention</li> </ul> </li> <li>5. Discuss research related to emerging diseases and disorders (such as: autism, VRSA, PTSD, Listeria, seasonal flu, COVID19)</li> <li>6. Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease. <ul style="list-style-type: none"> <li>a. Gene testing</li> <li>b. Gene therapy</li> <li>c. Human proteomics</li> <li>d. Cloning</li> <li>e. Stem cell research</li> </ul> </li> <li>7. Demonstrate competency in basic math skills and mathematical conversions as they relate to healthcare.</li> </ul>

Course Code	Course Name	Essential Standards	Objectives
			<p>8. Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.</p> <p>9. Demonstrate use of the 24-hour clock/military time.</p>
		2. Communication	1. Use medical terminology and medical math to communicate information. Oral and written
		5. Legal responsibilities	1. Apply standards for Health Insurance Portability and Accountability Act (HIPAA)
		7. Safety practices	<p>1. Demonstrate principles of infection control using standard precautions in relation to the disease process and prevention.</p> <p>2. Comply with safety signs, symbols and labels.</p>
		9. Health Maintenance	<p>1. Describe strategies for prevention of diseases including health screenings and examinations.</p> <p>2. Apply practices that promote prevention of disease and injury.</p>
		10. Technical Skills	1. Revisit procedures for measuring and
5540	Medical Terminology	1. Academic foundations	<p>1. Identify and understand the basic structural and functional organization of the human body (tissue, organ, and system).</p> <p>2. Recognize body planes, directional terms, quadrants, and cavities</p> <p>3. Describe common diseases and disorders of each body system (prevention, pathology, diagnosis, and treatment).</p> <p>4. Recognize emerging diseases and disorders.</p> <p>5. Investigate biomedical therapies as they relate to the prevention, pathology, and treatment of disease.</p>

Course Code	Course Name	Essential Standards	Objectives
		2. Communication	<ol style="list-style-type: none"> <li>1. Construct and define basic medical terminology suffixes, prefixes, roots, and abbreviations.</li> <li>2. Use appropriate medical terms to communicate information.</li> <li>3. Identify medical abbreviations to communicate information.</li> <li>4. Determine definition of a medical term by examining its component word parts</li> <li>5. Pronounce medical terms.</li> <li>6. Apply speaking and active listening skills.</li> <li>7. Interpret verbal communication.</li> </ol>
		10. Technical Skills	<ol style="list-style-type: none"> <li>1. Revisit procedures for measuring and recording vital signs as you approach the appropriate body system. (Recognition of normal ranges and understanding what the data means in relation to body systems and disease.)</li> </ol>
<b>EMS</b>			
5531	Emergency Medical Services 1	1. Academic foundations	<ol style="list-style-type: none"> <li>1. Identify and understand the basic structural and functional organization of the human body (tissue, organ, and system).</li> </ol>
		2. Communication	<ol style="list-style-type: none"> <li>1. Construct and define basic medical terminology suffixes, prefixes, roots, and abbreviations.</li> </ol>
		3. Systems	<ol style="list-style-type: none"> <li>1. Define emergency medical services (EMS) systems.</li> </ol>

Course Code	Course Name	Essential Standards	Objectives
		4. Employability skills	<ol style="list-style-type: none"> <li>1. Demonstrate basic professional standards as they apply to hygiene, dress, language, confidentiality and behavior.</li> <li>2. Identify personal traits or attitudes desirable in a member of the career ready healthcare team</li> </ol>
		5. Legal responsibilities	<ol style="list-style-type: none"> <li>1. Recognize and explain the differences in HIPAA and FERPA.</li> <li>2. Understand the patient's "Bill of Rights"</li> </ol>
		7. Safety practices	<ol style="list-style-type: none"> <li>1. Identify various blood borne pathogens</li> <li>2. Practice infection control procedures based on standard precautions (OSHA/CDC)</li> <li>3. Explain personal safety practices to include hygiene, sanitation, body mechanics and ergonomics.</li> </ol>
		9. Health Maintenance	<ol style="list-style-type: none"> <li>1. Explain how to recognize the causes and signals of personal stress.</li> <li>2. Identify positive and negative behaviors/factors affecting the EMS professional's health and well-being.</li> <li>3. Discuss the relationship between health, lifestyles, and personal risk factors including health screenings, immunizations, and examinations.</li> <li>4. Demonstrate proper body mechanics.</li> </ol>
		10. Technical Skills	<ol style="list-style-type: none"> <li>1. Demonstrate basic first aid skills</li> <li>2. Stop the Bleed Training</li> <li>3. Demonstrate CPR and AED use</li> </ol>

Course Code	Course Name	Essential Standards	Objectives
5532	Emergency Medical Services 2	1. Academic foundations	<ol style="list-style-type: none"> <li>1. Cardiac and respiratory emergencies</li> <li>2. Recognize – Internal bleeding, Soft tissue injuries.</li> <li>3. Understand the importance of care for head and spine injuries.</li> <li>4. Understand what happens during shock and how this effects the organs.</li> </ol>
		2. Communication	<ol style="list-style-type: none"> <li>1. Define more advanced medical terms</li> <li>2. Apply speaking and active listening skills.</li> <li>3. Understand behavioral emergencies and how to communicate.</li> </ol>
		3. Systems	<ol style="list-style-type: none"> <li>1. Differentiate the roles and responsibilities of EMS professionals from other healthcare professionals.</li> </ol>
		4. Employability skills	<ol style="list-style-type: none"> <li>1. Create an electronic portfolio to include a resume and any certificates of training that reinforce employability skills.</li> <li>2. Reinforce personal traits or attitudes desirable in a member of the career ready healthcare team</li> </ol>
		5. Legal responsibilities	<ol style="list-style-type: none"> <li>1. Review and reinforce patient consent, scope of practice, HIPAA and patient’s ‘Bill of Rights’</li> <li>2. Describe and understand patient consent parameters</li> <li>3. Describe and understand Scope of Practice</li> </ol>
		7. Safety practices	<ol style="list-style-type: none"> <li>1. Reinforce blood borne pathogens, and infection control training.</li> <li>2. Understand how to use PPE and how to remove it in a safe way.</li> <li>3. Determine scene safety based on the type of patient call, personnel, bystanders, environmental surroundings, etc.</li> </ol>

Course Code	Course Name	Essential Standards	Objectives
		9. Health Maintenance	<ol style="list-style-type: none"> <li>1. Reinforce positive steps that the EMS professional takes to help reduce/alleviate stress and promote health and wellness.</li> <li>2. Demonstrate proper body mechanic</li> </ol>
		10. Technical Skills	<ol style="list-style-type: none"> <li>1. Demonstrate basic first aid skills               <ol style="list-style-type: none"> <li>a. Understand about allergic reactions, drug overdoses, poisonings, heat injuries, cold injuries etc.</li> </ol> </li> <li>2. Reinforce the CPR / AED Response</li> <li>3. What it means to be a first responder</li> <li>4. Reinforce how to “Stop the Bleed”</li> <li>5. Demonstrate how to take a blood pressure, count respirations, describe skin color and temperature and its’ significance.</li> <li>6. Exposure to equipment used in response to emergencies.</li> </ol>
<b>Sports Medicine</b>			
5555	Sports Medicine 1	1. Academic foundations	<ol style="list-style-type: none"> <li>1. Identify major bones and muscle groups</li> <li>2. Differentiate between various types of body tissues (muscle, bone, tendon, ligament, cartilage)</li> <li>3. Differentiate between common types of acute and chronic injuries (sprains, strains, fractures, tendonitis, etc.)</li> <li>4. Differentiate between various stretching techniques.</li> </ol>
		2. Communication	<ol style="list-style-type: none"> <li>1. Identify athletic training room forms such as treatment logs, rehab records, emergency information cards and consent forms</li> </ol>

Course Code	Course Name	Essential Standards	Objectives
		4. Employability skills	<ol style="list-style-type: none"> <li>1. Demonstrate basic professional standards as they apply to hygiene, dress, language, confidentiality and behavior.</li> <li>2. Identify personal traits or attitudes desirable in a member of the career ready healthcare team</li> </ol>
		5. Legal responsibilities	<ol style="list-style-type: none"> <li>1. Recognize and explain the differences in HIPAA and FERPA</li> </ol>
		7. Safety practices	<ol style="list-style-type: none"> <li>1. Identify various blood borne pathogens</li> <li>2. Practice infection control procedures based on standard precautions (OSHA/CDC</li> <li>3. Explain personal safety practices to include hygiene, sanitation, body mechanics and ergonomics.</li> <li>4. Identify the components of a venue specific emergency action plan.</li> </ol>
		8. Teamwork	<ol style="list-style-type: none"> <li>1. Identify the members and roles of the sports medicine team</li> </ol>
		9. Health Maintenance	<ol style="list-style-type: none"> <li>1. Discuss nutritional concerns of athletes including hydration, types of diet, nutritional and performance enhancing supplements and pre/post game meal considerations.</li> <li>2. Describe the significance of health screenings and examinations (pre-participation exams)</li> <li>3. Identify practices that promote prevention of disease and injury through education</li> <li>4. Explain the relationships between poor body mechanics and</li> </ol>

Course Code	Course Name	Essential Standards	Objectives
			potential for injury 5. Discuss complementary and alternative health care practices.
		10. Technical Skills	1. Demonstrate basic first aid skills 2. Demonstrate CPR and AED use 3. Observe, measure, record and evaluate vital signs 4. Recognize basic terminology of taping, padding and wrapping procedures.
5556	Sports Medicine 2	1. Academic Foundation	1. Describe general injury causations and/or mechanisms 2. Describe the phases of the soft tissue and bony healing processes. 3. Describe the components of the evaluation process, such as history, observation, palpation and special tests 4. Describe the appropriate assessment, care and rehabilitation of the following areas: ankle, knee, shoulder 5. Identify anatomical landmarks as it relates to injury evaluation 6. Describe the phases of a rehabilitation program 7. Identify various rehabilitation techniques, goals and strategies. 8. Describe considerations for treating injuries in various stages of the healing process.
		2. Communication	1. Demonstrate obtaining pertinent patient information 2. Create an injury report using the SOAP note.
		3. Systems	1. Describe the components and functionality of a sports medicine facility

Course Code	Course Name	Essential Standards	Objectives
		4. Employability Skills	1. Demonstrate basic professional standards as they apply to hygiene, dress, language, confidentiality and behavior.
		5. Legal Responsibilities	1. Identify duties of sports medicine providers according to regulations, policies, laws and legislated rights of patients.
		6. Ethics	1. Identify responsible practices within the ethical framework of the sports medicine profession 2. Differentiate between ethical and legal issues and practices impact sports medicine professionals.
		7. Safety Practices	1. Apply principles of personal safety practices 2. Demonstrate appropriate use of infection control measures.
		10. Technical Skills	1. Observe, measure, record and evaluate vital signs 2. Demonstrate basic taping and wrapping skills 3. Demonstrate specific joint motions, stretching techniques and relate to anatomical landmarks.

## Hospitality and Tourism Cluster

Course Code	Course Name	Essential Standards
<b>Culinary Arts Management</b>		
5723	Baking and Pastry	B1. Demonstrate sanitary and safety procedures. C1. Analyze responsibilities associated with shop management and ownership. D1. Analyze techniques applied when working with bakeshop formulas. E1. Describe basic baking principles. F1. Analyze methods of producing bakeshop products to meet special dietary needs. G1. Demonstrate basic baking techniques for different types of breads. H1. Prepare a variety of desserts and pastries. I1. Demonstrate advanced preparation technique skills.
5722	Introduction to Culinary Arts Management	B1. Evaluate procedures to avoid food borne illnesses. B2. Analyze safe practices in foodservice facilities. C1. Investigate factors that lead to professional practices. D1. Examine the history and development of the foodservice industry. E1. Examine customer service standards for a professional foodservice operation. E2. Contrast the various styles of meal service offered in dining establishments. F1. Explore a variety of basic cooking techniques in foodservice. G1. Examine the different parts of recipes and menus. H1. Apply basic culinary math skills knowledge. I1. Assess the roles of nutrients in the diet. J1. Investigate recycling and conservation practices in the foodservice industry.
5720	Culinary Arts Management 1	J1. Investigate recycling and conservation practices in the foodservice industry. B1. Recommend strategies to prevent biological, physical, and chemical hazards. B2. Perform safe behaviors in foodservice facilities. C1. Evaluate industry standard professional practices. D1. Examine foodservice career opportunities.

Course Code	Course Name	Essential Standards
		E1. Illustrate the mechanics of table service. E2. Examine the points of proper guest interaction. F1. Demonstrate a variety of cooking techniques in foodservice. G1. Examine recipes and their role in a foodservice facility. H1. Demonstrate knowledge in culinary math skills. I1. Analyze nutritional requirements for different populations. J1. Develop a basic knowledge of the foundations of cuisine. K1. Investigate the role of management in the foodservice industry. L1. Investigate sustainability practices in the foodservice industry.
5721	Culinary Arts Management 2	B1. Integrate food safety and sanitation practices. B2. Model industry-standard safety procedures. C1. Recommend professional practices that lead to success in the foodservice industry. D1. Develop a dining room operation consisting of multiple stations. E1. Model advanced cooking techniques. F1. Create menus according to industry guidelines. F2. Analyze the performance of menus. G1. Perform mathematical functions related to foodservice operations. H1. Plan food choices to meet nutritional requirements for different populations. I1. Analyze culinary techniques of various cuisines. J1. Model management roles in the foodservice industry. K1. Incorporate recycling and sustainability practices in foodservice operations.
<b>Hospitality and Tourism Management</b>		
5478	Introduction to Hospitality and Tourism Management	B1. Analyze the history and development of the hospitality industry. C1. Differentiate between various hospitality and tourism segments. D1. Evaluate service techniques that promote guest satisfaction. E1. Assess common safety, security, and sanitation policies and procedures used in the hospitality and tourism industry. F1. Critique current trends in the hospitality and tourism industry. G1. Evaluate career development and employability skills

Course Code	Course Name	Essential Standards
5473	Lodging Management	<p>B1. Analyze the history, organization, and structure of the lodging industry.</p> <p>C1. Evaluate best practices that promote guest satisfaction in the lodging industry.</p> <p>D1. Analyze the role of the front office division in the lodging industry.</p> <p>E1. Analyze the role of the housekeeping division in the lodging industry.</p> <p>F1. Analyze accounting operations and performance measurements used in the lodging industry.</p> <p>G1. Assess common safety and security policies and procedures used in the lodging industry.</p> <p>H1. Analyze career development and employability skills in the lodging industry.</p>
5474	Travel and Tourism Management	<p>B1. Analyze the history and development of the travel and tourism industry.</p> <p>C1. Analyze the key sectors of the travel and tourism industry.</p> <p>D1. Explore different modes of transportation, types of tour operators, lodging providers and travel facilitators.</p> <p>E1. Evaluate marketing and sales information for travel and tourism management.</p> <p>F1. Evaluate the current trends in the travel and tourism management industry.</p> <p>G1. Analyze career paths and opportunities in travel and tourism.</p>
5475	Event and Entertainment Management	<p>B1. Differentiate between various event and entertainment segments.</p> <p>C1. Analyze the fundamental purpose and basic organizational structure of events and entertainment options.</p> <p>D1. Differentiate food and beverage operations in the event and entertainment industry.</p> <p>E1. Evaluate management techniques that promote client or service provider satisfaction.</p> <p>F1. Assess common safety and security policies, procedures used in the event, and entertainment industry.</p> <p>G1. Critique current trends in the event and entertainment industry.</p> <p>H1. Evaluate career development and employability skills.</p>

## Human Services/Family and Consumer Sciences Cluster

Course Code	Course Name	Essential Standards
<b>Barber/Master Hair Care</b>		
6158	Barber/Master Hair Care 1	<b>Standards Mandated by South Carolina Labor Licensing and Regulations</b>
6159	Barber/Master Hair Care 2	
6160	Barber/Master Hair Care 3	
6161	Barber/Master Hair Care 4	
<b>Cosmetology</b>		
6150	Cosmetology 1	<b>Standards Mandated by South Carolina Labor Licensing and Regulations</b>
6151	Cosmetology 2	
6152	Cosmetology 3	
6153	Cosmetology 4	

Course Code	Course Name	Essential Standards
<b>Esthetics</b>		
6162	Esthetics 1	<b>Standards Mandated by South Carolina Labor Licensing and Regulations</b>
6163	Esthetics 2	
6164	Esthetics 3	
6165	Esthetics 4	
<b>Nail Technology</b>		
6154	Nail Technology 1	<b>Standards Mandated by South Carolina Labor Licensing and Regulations</b>
6155	Nail Technology 2	
6156	Nail Technology 3	
6157	Nail Technology 4	
<b>Family and Consumer Sciences</b>		
5800	Child Development 1	<p>B1. Analyze parenting roles and responsibilities.</p> <p>C1. Identify characteristics of prenatal care, pregnancy, and childbirth.</p> <p>D1. Analyze the stages of human growth and development during infancy and toddlerhood.</p> <p>E1. Examine issues related to the health and safety of children.</p> <p>F1. Explore early childhood career options and employability skills.</p>
5801	Child Development 2	<p>B1. Analyze the stages of growth and development during early childhood.</p> <p>C1. Analyze practices that promote the health and safety of children.</p> <p>D1. Evaluate techniques for positive collaborative relationships.</p> <p>E1. Evaluate childcare agencies and services.</p> <p>F1. Demonstrate professional practices, ethics, and standards related to working with children.</p>

Course Code	Course Name	Essential Standards
5808	Family and Consumer Sciences 1	<p>B1. Analyze personal character traits that impact interpersonal relationships.</p> <p>C1. Investigate knowledge, skills, and attitudes of potential careers.</p> <p>D1. Analyze the effects of cultural and social diversities on individuals and families.</p> <p>E1. Analyze factors that affect nutrition and wellness.</p> <p>F1. Examine resources that meet the needs and wants of consumers.</p> <p>G1. Analyze the effects heredity, parenting, and environment on human growth and development.</p> <p>H1. Demonstrate basic skills for producing, repairing, and altering textile and apparel products.</p>
5809	Family and Consumer Sciences 2	<p>B1. Demonstrate functional relationships in the family, workplace and community.</p> <p>C1. Analyze principles of human growth and development.</p> <p>D1. Analyze various factors that lead to strengthening and improving family systems.</p> <p>E1. Explore the management of resources that meet the needs of individuals and families.</p> <p>F1. Analyze factors that influence nutrition and wellness across the life span.</p> <p>G1. Demonstrate transferable and employability skills in school, community, and workplace settings.</p>
5820	Family Life Education 1	<p>B1. Apply communication skills that contribute to healthy relationship.</p> <p>B2. Analyze the decision making process.</p> <p>B3. Analyze the various types of relationships.</p> <p>C1. Determine the risk factors that are damaging to a healthy lifestyle.</p> <p>D1. Determine the importance of preparing for a family.</p> <p>E1. Identify factors that lead to effective resource management skills.</p> <p>F1. Explore different types of individual and family crises.</p> <p>G1. Explore family related career paths.</p>
5821	Family Life Education 2	<p>B1. Explain the impact of health on families and individuals.</p> <p>C1. Examine how functions and structures of families change over the life span.</p> <p>D1. Analyze how financial management affects individuals and families.</p> <p>E1. Determine appropriate responses to handling family crises.</p>

Course Code	Course Name	Essential Standards
		F1. Investigate employability skills that lead to career success.
5804	Fashion, Fabric, and Design 1	<p>B1. Identify career pathways and characteristics of professionalism in the apparel and textile industries.</p> <p>C1. Identify components of the fashion industry.</p> <p>D1. Identify the characteristics and performance of fibers, fabrics, and textile products.</p> <p>E1. Analyze design concepts and skills used in fashion design.</p> <p>F1. Construct textile/apparel products.</p> <p>G1. Investigate marketing strategies that influence consumer decision making.</p>
5805	Fashion, Fabric, and Design 2	<p>B1. Examine career pathways and characteristics of professionalism in the apparel and textile industries.</p> <p>C1. Analyze components of the fashion industry.</p> <p>D1. Evaluate characteristics and performance of textile products.</p> <p>E1. Integrate fashion design concepts and skills to develop a product.</p> <p>F1. Produce advanced textile/apparel products.</p> <p>G1. Identify marketing and merchandising strategies within the fashion and textile apparel industries.</p>
5812	Financial Fitness 1	<p>B1. Apply the decision-making process to consumer choices.</p> <p>C1. Explore career opportunities and professional requirements for the consumer service industry.</p> <p>D1. Evaluate financial resource management to meet the goals of individuals and families.</p> <p>D2. Analyze the use of credit and debt in financial management</p> <p>E1. Evaluate products and services based on technology applications.</p>
5813	Financial Fitness 2	<p>B1. Analyze policies that support consumer rights and responsibilities.</p> <p>C1. Investigate management of financial resources.</p> <p>D1. Analyze factors in developing a long-term financial plan.</p> <p>E1. Evaluate insurance as a risk management strategy.</p> <p>F1. Examine saving and investment options.</p> <p>G1. Analyze the relationship of the environment to family and consumer resources.</p>

Course Code	Course Name	Essential Standards
		H1. Apply knowledge and skills required to be successful in careers in consumer services.
5824	Foods and Nutrition 1	B1. Analyze factors needed for nutritional wellness. C1. Implement safety and sanitation procedures. D1. Demonstrate skills needed prepare recipes. E1. Apply appropriate etiquette and table setting for various settings and occasions. F1. Identify career opportunities in foods and nutrition.
5825	Foods and Nutrition 2	B1. Evaluate food selection options. C1. Evaluate safety and sanitation procedures. C2. Explain the role of government agencies in regulating practices to keep the food supply safe. D1. Analyze factors that affect consumer purchases. E1. Determine appropriate etiquette and table setting techniques. F1. Compare occupations and preparation requirements for careers in foods and nutrition related occupations.
5830	Housing and Interiors 1	B1. Analyze the legal aspects of purchasing and leasing housing. B2. Analyze factors that affect housing and housing selection. C1. Examine features of housing structural design. D1. Evaluate elements and principles of design. E1. Explore career pathways within the housing and design industry.
5831	Housing and Interiors 2	B1. Integrate the elements and principles of design in residential settings. C1. Evaluate interior backgrounds, materials, and treatments. D1. Explore features of furnishings that are characteristic of various historical periods. D2. Analyze factors that influence furniture selection and arrangement. E1. Evaluate kitchen, laundry and bathrooms designs. F1. Assess home elements that enhance living space. G1. Explore educational and professional preparation necessary for career success. G2. Describe marketing skills and strategies used in the housing industry.

Course Code	Course Name	Essential Standards
5834	Human Development: Responsible Life Choices 1	B1. Analyze components of healthy relationships. C1. Analyze the function of the family in providing a nurturing environment. D1. Analyze factors that affect adolescent growth and development. E1. Evaluate factors that promote comprehensive health education. E2. Analyze components of reproductive health education. F1. Assess the responsibilities of pregnancy and parenthood. G1. Explore careers in human development.
5835	Human Development: Responsible Life Choices 2	B1. Analyze components of healthy relationships. B2. Evaluate effective conflict management techniques. C1. Identify factors that promote psychological health. D1. Determine financial responsibilities of parenthood. D2. Evaluate parenting styles. E1. Investigate careers in human development.
5816	Parenting Education 1	B1. Analyze parenting practices that maximize human development. C1. Evaluate the significance of health and wellness. C2. Analyze issues associated with adolescent parenthood. D1. Analyze the roles, responsibilities, and rewards of parenting. D2. Examine the management of resources across the lifespan. E1. Evaluate methods of family planning. F1. Examine interests and career opportunities related to parenting education.
5817	Parenting Education 2	B1. Analyze interpersonal skills for successful parenting. C1. Analyze support systems for adolescent parents and their children. D1. Investigate legal and ethical responsibilities of parenthood. D2. Analyze personal attributes and skills for effective parenting. E1. Demonstrate professional ethics and employability skills.

Course Code	Course Name	Essential Standards
5759	Sports Nutrition 1	B1. Summarize sports nutrition concepts. C1. Analyze various nutritional and dietary needs that affect health, appearance, and peak performance. C2. Analyze preparation of healthy food. D1. Investigate various factors that affect physical performance. E1. Analyze various trends in sports nutrition. F1. Analyze career opportunities in sports and nutrition.
5760	Sports Nutrition 2	B1. Analyze various nutritional and dietary needs that affect health, appearance, and peak performance. B2. Analyze the preparation of healthy foods. C1. Describe the processes of digestion and metabolism. D1. Analyze factors to maximize physical performance. E1. Analyze various trends in sports nutrition. F1. Compare sports nutrition related career options and preparation requirements.

## Information Technology Cluster

Course Code	Course Name	Essential Standards
5351	Advanced Animation	<p>F. Create a story for a storyboard, know the purpose of 3D graphics and animation, list the objects, outline and link action sequences, create scene by scene illustrations</p> <p>G. Understand the software and navigation tools, use hotkeys, map between coordinate systems, use Orthographic/Perspective Views, select objects and sub objects, use positional transformations</p> <p>H. Manipulate objects: modify properties, transform and clone, use object arrays, compound objects, spline objects, 2D to 3D, modify edges and faces and vertices convert objects</p> <p>I. Specify object ambience and diffusion, add material properties, create surface patterns, reflections and refractions, wrap images, modify the surface, modify background, use opacity and transparency</p> <p>J. Use paint effects: pressure curves, cycling, custom brush, effects mesh, object shading, mesh settings and environments, texture, illuminating and shadowing</p> <p>K. Key frame: position, rotation, graph editor, tangent settings, dope sheet, driven keys, motion path</p> <p>L. Character rigging: rigging tools, skinning tools, skeleton joints (limits and constraints), kinematics, parent/child hierarchy, influence objects</p> <p>M. Character Animation: handles and mirror joints, foot and knee controls, back spine, legs, hip, constraints, head controls, arms, fingers, skin</p>
5323	Advanced Computer Operating Systems	<p>F. Install, Configure, and Activate the operating system, understand the boot process; for given scenarios use the shell environment and command line utilities, manage start-up and shutdown, manage system processes, use package management, configure internet and web access, set up virtualization, configure and set up the network, set up cloud topologies</p> <p>G. Set up BIOS, devices, and install drivers, customize the display, optimize the system for performance, set up power management parameters, configure virtual memory</p>

Course Code	Course Name	Essential Standards
		<p>H. Given a scenario: manage storage devices and file systems, set up partitions and RAID and volumes, create and modify and redirect files, backup and restore and compress files, optimize and troubleshoot disks</p> <p>I. For a scenario: perform software installations, configurations, updates, and removals, manage services, set up user account control, automate and schedule jobs</p> <p>J. For a scenario: manage user and group access, set up user and group policies and permissions and ownership, configure access and authentication methods, set up logging services, configure remote access and firewalls, perform operating system updates, set up system security, and perform disaster recovery</p> <p>K. Configure wire and wireless networks, set up shared network resources and printers</p> <p>L. Given a scenario: troubleshoot performance and user and hardware and application and network issues</p>
5321	Advanced Computer Repair and Service	<p>G. Understand network protocols and ports, hardware devices, configure wired and wireless network, configure network services, use networking tools, understand internet connection types</p> <p>H. Know network cabling types and characteristics, installation: RAM, storage, motherboards, peripherals, cpus, add-on cards, power supplies, printers, other devices</p> <p>I. Understand virtualization and cloud computing concepts; setup and configure client-side virtualization</p> <p>J. Troubleshoot network and hardware</p> <p>K. Install and Configure an operating system</p> <p>L. Set up security measures (wireless), detect and remove malware, secure mobile devices and workstations</p> <p>M. Troubleshoot application, security, and application issues</p> <p>N. Understand industry best practices in security, safety, disaster management, and privacy</p>
5372	Advanced Cyber Security	<p>F. Know the importance of security awareness and training, install environmental controls, write security policies</p> <p>G. Plan business contingencies, execute disaster recovery plans and procedures, perform secure data destruction</p>

Course Code	Course Name	Essential Standards
		<p>H. Use secure network administration principles, know network design and components, implement common protocols and services, troubleshoot security issues.</p> <p>I. Implement risk mitigation strategies, demonstrate basic forensic and incident response procedures, select security controls</p> <p>J. Understand the types of malware and attacks, e.g., wireless, application, discover security Threats and vulnerabilities perform penetration testing.</p>
5311	Advanced Networking	<p>F. Understand network devices and functions, services and applications, install and configure services and applications, use network tools, understand network topologies and implementation, set up a basic network</p> <p>G. Perform network monitoring, analyze metrics, use configuration management, perform segmentation, install and apply patches and updates, configure a wireless LAN</p> <p>H. Implement network hardening techniques, set up a firewall, set up access control, perform some basic forensics</p> <p>I. Use troubleshooting tools and techniques to resolve wireless and wired issues, resolve security issues, resolve WAN issues</p>
5313	Advanced Server Administration	<p>F. Know the server form factors, for a scenario: install and configure and maintain server components, define power and cooling components,</p> <p>G. Install and configure server operating systems, compare and contrast server roles and types, perform user access control methods, perform maintenance, set up virtualization, perform asset management and documentation</p> <p>H. Install and deploy primary storage devices base on given specifications and interfaces, configure RAID, calculate storage capacity for future usage models.</p> <p>I. Apply physical security measures, apply server hardening techniques, set up network security and protocols, set up user access control, implement environmental controls, set up security procedures</p> <p>J. Configure and set up a network based on a scenario</p> <p>I. Perform basic troubleshooting: hardware, software, network, storage, security.</p>

Course Code	Course Name	Essential Standards
5033	Advanced Web Page Design and Development	<p>F. Understand web design and development practices, use technical documentation for planning and design, know static vs dynamic, understand client/server side scripting and database integration, understand government and industry guidelines</p> <p>G. Construct a website using HTML: inputs, tables, meta-tags, streaming media</p> <p>H. Construct a website using CSS: design techniques, selectors, positioning, responsive design, integrate HTML, integrate various devices</p> <p>I. Construct a website use JavaScript: operators and syntax, events, functions, conditionals and loops, strings and arrays, form processing, libraries</p>
5374	Computer Forensics	<p>F. Define terms related to forensics and computer forensics, know the role of computer forensics in society, evaluate visible and hidden data, know the hardware and software essential for computer forensics.</p> <p>G. Know the four phases of working a case, know the forensic examination process, acquire evidence, create and maintain case logs, report findings.</p> <p>H. Know the search and seizure laws, understand consent search vs search warrant, collect and document evidence.</p> <p>I. Understand storage media and their locations, control data: erase, recover, analyze, hardware/software write blocking, data acquisition logs.</p>
5322	Computer Operating Systems	<p>F. Install and setup an operating system: configure, use the command line interface, manage: start-up, shutdown, system processes, package management, configure internet and access control, install system modules, configure local options</p> <p>G. Configure and optimize hardware: Bios, devices, drivers, display, performance, power management, virtual memory.</p> <p>H. Manage, configure, and troubleshoot storage devices and file systems; backup, restore, and compress files</p> <p>I. Install and configure applications and services, user accounts and controls, automate and schedule jobs</p> <p>J. Manage users and group access, set up remote access and firewalls, perform system updates, set up system security, perform disaster recovery</p> <p>K. Configure wired and wireless networks, set up local and shared printers</p>

Course Code	Course Name	Essential Standards
5050	Computer Programming 1	<p>F. Know basic computer and programming terminology, hardware and software components, programming development environment components, object oriented programming concepts</p> <p>G. Document the program purpose, inputs, outputs, variables and constants, data types, scope of variables</p> <p>H. Understand program sequence, develop pseudo code, key in and execute a program, debug and run the program</p> <p>I. Programming: describe program objects, events, procedures, assignment statements; comment and document code, define operators and understand precedence, list commands and statements, declare variables and constants, use appropriate data types; write a program: perform calculations, get input, use decision structures and looping, sub procedures, pass arguments and parameters to functions</p>
5051	Computer Programming 2	<p>D. Understand object-oriented programming, understand the development environment</p> <p>E. Document programs: purpose, input, out, variables, functions</p> <p>F. Programming: describe the objects and procedures, use assignment states, document code, use operators, understand operator precedence, use commands and statements, declare constants and variables, write an interactive program, use decision structures, generate random numbers, used loops and iterations, use built-in properties and functions, do number conversions, use sub procedures and functions passing arguments and parameters.</p>
5056	Computer Programming 1 with C++	<p>terminology, hardware and software components, programming development environment components, object oriented programming concepts</p> <p>G. Document the program purpose, inputs, outputs, variables and constants, data types, scope of variables</p> <p>H. Understand program sequence, develop pseudo code, key in and execute a program, debug and run the program</p> <p>I. Programming: describe program objects, events, procedures, assignment statements; comment and document code, define operators and understand precedence, list commands and statements, declare variables and constants, use appropriate data types; write a program: perform calculations, get input, use decision structures and looping, sub procedures, pass arguments and parameters to functions</p>

Course Code	Course Name	Essential Standards
5057	Computer Programming 2 with C++	D. Understand object-oriented programming, understand the development environment E. Document programs: purpose, input, out, variables, functions F. Programming: describe the objects and procedures, use assignment statems, document code, use operators, understand operator precedence, use commands and statements, declare constants and variables, write an interactive program, use decision structures, generate random numbers, used loops and iterations, use built-in properties and functions, do number conversions, use sub procedures and functions passing arguments and parameters.
5052	Computer Programming 1 with Java	F. Know basic computer and programming terminology, hardware and software components, programming development environment components, object oriented programming concepts G. Document the program purpose, inputs, outputs, variables and constants, data types, scope of variables H. Understand program sequence, develop pseudo code, key in and execute a program, debug and run the program I. Programming: describe program objects, events, procedures, assignment statements; comment and document code, define operators and understand precedence, list commands and statements, declare variables and constants, use appropriate data types; write a program: perform calculations, get input, use decision structures and looping, sub procedures, pass arguments and parameters to functions
5053	Computer Programming 2 with Java	D. Understand object-oriented programming, understand the development environment E. Document programs: purpose, input, out, variables, functions F. Programming: describe the objects and procedures, use assignment statems, document code, use operators, understand operator precedence, use commands and statements, declare constants and variables, write an interactive program, use decision structures, generate random numbers, used loops and iterations, use built-in properties and functions, do number conversions, use sub procedures and functions passing arguments and parameters .
5054	Computer Programming 1 with Visual Basic	F. Know basic computer and programming terminology, hardware and software components, programming development environment components, object oriented programming concepts

Course Code	Course Name	Essential Standards
		<p>G. Document the program purpose, inputs, outputs, variables and constants, data types, scope of variables</p> <p>H. Understand program sequence, develop pseudo code, key in and execute a program, debug and run the program</p> <p>I. Programming: describe program objects, events, procedures, assignment statements; comment and document code, define operators and understand precedence, list commands and statements, declare variables and constants, use appropriate data types; write a program: perform calculations, get input, use decision structures and looping, sub procedures, pass arguments and parameters to functions</p>
5055	Computer Programming 2 with Visual Basic	<p>D. Understand object-oriented programming, understand the development environment</p> <p>E. Document programs: purpose, input, out, variables, functions</p> <p>F. Programming: describe the objects and procedures, use assignment statements, document code, use operators, understand operator precedence, use commands and statements, declare constants and variables, write an interactive program, use decision structures, generate random numbers, use loops and iterations, use built-in properties and functions, do number conversions, use sub procedures and functions passing arguments and parameters.</p>
5320	Computer Repair and Service	<p>F. Install and configure mobile devices, install components, connect and configure accessories and ports, integrate other mobile devices, configure mobile networks and devices, sync mobile devices</p> <p>G. Understand network protocols and ports, hardware devices, configure wired and wireless network, configure network services, use networking tools, understand internet connection types</p> <p>H. Know network cabling types and characteristics, installation: RAM, storage, motherboards, peripherals, cpus, add-on cards, power supplies, printers, other devices</p> <p>J. Troubleshoot network and hardware</p> <p>K. Install and Configure an operating system</p> <p>L. Set up security measures (wireless), detect and remove malware, secure mobile devices and workstations</p>

Course Code	Course Name	Essential Standards
5370	Cyber Security Fundamentals	<p>F. Define cybersecurity terms, know the importance of information and internet security, know concepts of confidentiality, integrity, availability, know cybersecurity risk management, understand the management of security threats, industry standards/regulations, code of ethics, various types of security</p> <p>G. Analyze and characterize cyber threats, attacks and vulnerabilities, categorize attack sources and originators, understand malware and attacks, attack prevention</p> <p>H. Understand networking and networking terms,</p> <p>I. Network security terms, know protocol security, security layering and tools, network attack prevention and firewalls, port and network address translation</p> <p>J. Operation system protection practices, file systems and permissions, auditing policies and logs, operating system attack prevention</p> <p>K. Identify authorization and authentication, types of permissions, types of access control, multifactor authentication, passwords and usage, backup and restore, secure servers.</p>
5324	Database Design and Programming with SQL	<p>D. Describe the database development process, distinguish between data and information</p> <p>E. Understand conceptual model vs physical implementation, know the for goals of entity relationship modeling, understand all aspects of entities, entity identifiers, mandatory and optional attributes</p> <p>F. Know relationship optionality and cardinality, construct ERD components, ER Dish: label relationships, matrix diagram</p> <p>G. Know the relationships between super types and subtypes and create an ERD, understand structural and procedural business rules within and ERD with diagram</p> <p>H. Entity Relationships: transferability and non-transferability, redundant, many-to-many, UID, CRUD analysis</p> <p>I. Know the different types of unique identifiers; purpose of normalization; rules of First Normal Form, Second Normal Form, and Third Normal Form</p> <p>J. Data modeling restraints, exclusive OR relationships, arc constraint diagram, hierarchical relationships and model, data modeling</p> <p>M. Transform conceptual model to physical model: primary key, foreign key, column-integrity rule, keys from table diagram, transform ERD into tables, columns, keys and constraints</p>

Course Code	Course Name	Essential Standards
		<p>N. SQL Programming: CREATE, INSERT, SELECT, DELETE, ALTER TABLE</p> <p>P. Oracle Database Environment: modify data, match projection, selection, join; display data and calculations</p> <p>Q. Concatenation, aliases, SELECT, DISTINCT, DESCRIBE, WHERE, BETWEEN, LIKE, NULL, string and date values</p> <p>R. Restrict results: conditional, precedence, ascending and descending, alias, row/column ordering, single and multi-row functions</p> <p>T. Character, number, date functions: LOWER, UPPER, INITCAP, CONCAT, SUBSTR, LENGTH, INSTR, LPAD, TRIM, REPLACE, ROUND, TRUNC, MOD, MONTHS_BETWEEN, ADD_MONTHS, NEXT_DAY, LAST_DAY, SYSDATE, arithmetic operators with date</p> <p>U. Single row functions: data type conversion, TO_CHAR, TO_NUMBER, TO_DATE, YYYY and RRRR for date, nested functions, COALESCE, NVL, NVL2, NULLIF, DECODE, CASE, IF-THEN-ELSE</p> <p>V. Table joins: join syntax, cross join, Cartesian product, ANSI standard, join tables, inner and outer join, tree-structured report, format hierarchal data.</p> <p>W. Group functions: SUM, AVG, COUNT, MIN, MAX, STDDEV, VARIANCE, DISTINCT, NVL</p>
5326	Database Programming with PL/SQL	<p>D: Know the structure of PL/SQL block, identify the different blocks, generate output</p> <p>E. PL/SQL variables: syntax, usage, assignment, lexical units, identifiers, comments, datatypes and categories, declaration and initialization, datatype conversions, built-in functions, operators and usage, variable scope and visibility, nested blocks and variable usage,</p> <p>F. Use SQL within PL/SQL: DML statements using insert, update, delete, and merge data; INTO clause, SELECT statement, variable naming and declaration, data manipulation, cursor attributes, transaction control statements,</p> <p>G. Conditional control: IF, IF-THEN-ELSE, NULL, CASE, LOOP, EXIT, WHILE, FOR, nested loops</p> <p>H. Cursor and Parameters: explicit cursor, cursor open and data fetch and cursor close, multiple row fetch, active set processing, cursor FOR loops, subquery, row lock, NOWAIT, UPDATE, DELETE, multiple cursors and nested loops, cursor parameter manipulation</p>

Course Code	Course Name	Essential Standards
		<p>I. Composite datatypes: user-defined PL/SQL records, INDEX creation</p> <p>J. Exception handling: EXCEPTION section creation, trap errors, raise and handle exceptions, use RAISE_APPLICATION_ERROR</p> <p>K. Subprograms and procedures: define and create a stored procedure, create a nested subprogram, invoke with parameters, DEFAULT option</p> <p>L. Subprograms and functions: define and create a stored function, use data dictionaries, write SQL_SELECT statements, DICTIONARY search engine, use DATA DICTIONARY views</p> <p>M. Subprograms and packages: invoke a package construct, use public and private package constructs, package syntax, Data Dictionary to manage packages, overloading, forward declarations, initialization block, bodiless, SQL package functions, packages that use PL/SQL tables and records</p>
5061 5062 5063	Discovering Computer Science; Discovering Computer Science Part 1; Discovering Computer Science Part 2	<p>F. Know computing terms, major functional components, file formats, software and hardware interactions</p> <p>G. Understand how algorithms and their applications, define and design a solution</p> <p>H. Write code that uses variables, events, functions, operators, conditional control structures, repetition, iteration, manipulate text and numerical data, edit and compile and test and debug a program</p> <p>I. Create a web page considering subject, devices, audience, layout, colors, links, graphics; create a web page with HTML elements and CSS styles.</p>
5350	Foundations of Animation	<p>G. Concept and Design: develop a concept, identify the purpose and audience, illustrate with sequential panels</p> <p>H. Storytelling and Storyboarding: Develop ideas in the story process, write descriptive stories with dialogue, create a character with traits, create a background, create a coherent narrative or sequence, create stick figures, demonstrate usage of a storyboard</p> <p>I. Software: Learn the software interface and tools, master commonly used tools, create and organize the workspace, use typography and layers and the library panel</p> <p>J. Objects: create, manipulate, import, modify; create and edit graphic symbols and instances, apply animation techniques, manipulate key frames and poses, manipulate objects, change frame rate and speed, create movement, use sound and video</p>

Course Code	Course Name	Essential Standards
5023 5028 5029	Fundamentals of Computing; Fundamentals of Computing Part 1; Fundamentals of Computing Part 2	F. Know key computing terms, explain impact of computing on society G. Identify key functional components, understand hardware terminology, manipulate binary data, understand digital representation of data, compare operating systems, understand hardware and software and system components H. Define a problem and create a solution using an algorithm I. Define a program and use block-based programming: variables, events, functions, operators, conditional control, repetition and iteration, text and numerical data; edit, run, test and debug a program J. Plan and create a web page that contains HTML and CSS styles.
5031	Fundamentals of Web Page Design and Development	G. Understand https encryption and data breaches, know the principles of e-commerce, understand the role of HTML, CSS, and JavaScript; look a various websites and their source code H. Create website content using text, graphics, hyperlinks; design a website solution using a storyboard, navigation plan, and mockups; appy color principles, best practices for web typography, ensure a quality look and feel I. Management: develop a file management system for website content, optimize media, solve coding errors, integrate third party components J. Create a website using HTML: HTML elements, documentation, HTML rules and elements, block and inline elements, relative and absolute hyperlinks, special characters, semantic elements, third party content K. Format a website using CSS: CSS syntax, inline and internal and external styles, format HTML elements, format page layout
5352	Game Design and Development	F. Know game design and development terminology, identify gaming genres, history G. Understand the game design process and steps involved; identify and collect and create game structures, evaluate basic gameplay, understand the narratives and stories and pertainment to game design, develop objectives and outcomes of a game, create technical documentation H. Create characters, environment, mapping, assets, tutorial; develop variables,fields, methods, code, implement, and instantiate objects, manipulate objects, use collections to

Course Code	Course Name	Essential Standards
		<p>simplify coding; animate characters to respond to controls, code decision structures, code collision detection logic, code looping structures; code gravity, velocity, acceleration, friction with formulas; code direction and rotation; use constraints</p> <p>I. Incorporate sound effects; develop a reward system</p>
5361	GIS 1	<p>D. History and societal implications of mapping, GIS, and remote sensing; GIS theory, industry applications</p> <p>E. Understand map types, purpose, information, and application; read a topographical map, sources of GIS information and application, convert latitude and longitude information</p> <p>F. Know the terminology associated with map coordinates and locations, interpret locations with Geographic Coordinate System, maps and map scale and projections and orienting terminology, Universe Transvers Mercator coordinate system, using aerial photography</p> <p>G. Know the components of GIS Project Management Model, utilize a GPS unit, use software to create a localized satellite map, use mapping software, use metadata, use geocoding addresses, symbol display of data, sorting, querying, selection techniques, edit feature data, spatial reference, georeferenced and add Control Points</p> <p>H. Layout and Print maps: define page and page margins, use map elements, use page space, digital archives</p>
5362	GIS 2	<p>D. Customize geospatial data display: edit layer properties, create layer files, edit an attribute table, perform relates and joins</p> <p>E. Manage, query, and symbolize geospatial data: label features, insert and copy and paste data, analyze land use and population and flood zone data, create geospatial data, symbolize a raster layer, geocode addresses, use dissolve features, hyperlink, spatially join data and create buffer functions.</p> <p>F. Create a geospatial model: create a geodatabase, import existing feature classes, import multiple feature classes, plan and build a local data inventory</p>
5025	IT Fundamentals	<p>F. Know terminology associated with the pc, mobile, and laptop platforms and I/O devices; set up a basic workstation, know the six steps of the troubleshooting process</p> <p>G. Environment and Safety: proper disposal, power and power management, device</p>

Course Code	Course Name	Essential Standards
		<p>placement, electrostatic discharge, Material Safety Data Sheets</p> <p>H. Understand the purpose and usage of operating systems: open-source and commercial, mobile and desktop, basic functions, install and secure, patch and update, licensing</p> <p>I. Install OS, applications, and software; manage folders and files; file types, configure e-mail platforms</p> <p>J. Identify hardware components, wired and wireless peripherals, security, connectors and ports, features and functions of wireless devices</p> <p>I. Set up a basic wired/wireless router, set up security and SSID, apply password, connect to the network, backup, file sharing</p> <p>M. Security: Describe security threats, use methods to prevent breaches, identify e-mail security breaches, evaluate websites, prevention</p>
5058	Java Fundamentals and Java Programming	<p>E. Know the basics of object-orient programming, understand the steps of problem solving, create storyboards with flowchart, understand algorithms; define: classes, instances, axes, scene setup, storyboard execution tasks, 3D modeling, comments, procedures, movement, variables, control variables, variables based on calculation, control structures for execution, math operations, conditionals, control statements, input and output, methods, classes, functions, procedures</p> <p>F. Programming components: class, subclass, parameters, inheritance, decision and control statements, testing, methods, constructors, variables, abstraction, looping, logic operators, string variables, Java constructs</p> <p>G. Use and Integrated Development Environment</p> <p>H. Control statements, objects, classes, methods: while, do-while, if, for, switch, break, this, create: methods, classes, object</p> <p>I. Manipulate arrays and strings: sort, compare, substring, indices, string functions</p>
5310	Networking Fundamentals	<p>F. Know the different network topologies, understand the different network devices and their functions, network infrastructures, networking media</p> <p>G. Understand the OSI model and the different devices at each level, understand the functions and protocols between each layer, identify applications and services at each layer</p> <p>H. Know the different Operating Systems</p>

Course Code	Course Name	Essential Standards
		<p>I. Know wired networking standards, access technologies, and cabling solutions.</p> <p>J. Know the wireless technologies and standards, hardware, software, and security, and configurations.</p> <p>K. Analyze functions at the different TCP/IP layers.</p> <p>l. Classify and configure addressing schemes: IP, MAC</p>
5327	SAS Programming 1	<p>D. Understand data processing terms, develop a program, understand file organization</p> <p>E. SAS basics: functionality, file types, program file and components</p> <p>F. Process raw data: write code to read</p> <p>G. SAS environment: SAS windowing (three primary), screen navigation, edit and execute code, save and retrieve code</p> <p>H. List report: plan and code to create</p> <p>I, J. Programming: assignments, variables, conditional logic</p> <p>K. Statistical Report: define, plan and code to create a summary and frequency report.</p> <p>L. Data Sets: data library, permanent and temporary library, CONTENTS procedure</p> <p>M: List Reports: PRINT procedure, filters, totals, sorts, subgroups, identity observations</p> <p>N. Data Step Programming: create variables, IF-THEN logic, LENGTH, select rows,</p>
5328	SAS Programming 2	<p>D. SAS Programming: Fundamental concepts of libraries using programming statements, file referencing, debug, create basic reports with formatted output, reference SAS data sets, design and write data set programs, perform DATA step processing and debug, apply user defined formats, create list and summary reports, generate statistic, create HTML output.</p> <p>E. Advanced Data: manipulate using variables, IF-THEN, read data sets, manipulate data, combine data sets and manipulate, convert data, use DO loops and arrays, read fixed and non-standard fixed data, apply formats, use date and time, read sequential and non-sequential data, read hierarchical files, create observations, produce bar and pie charts, control appearance.</p>
5312	Server Administration	<p>F. Given a scenario: install and configure and maintain server components, understand power and cooling</p> <p>G. Install and configure a server operating system, set up server roles, perform server administration and maintenance, set up virtualization, perform asset management</p>

Course Code	Course Name	Essential Standards
		<p>H. Given a scenario: install storage devices based on a specification, configure a RAID, create a storage plan for future growth.</p> <p>I. Apply server hardening techniques, implement access controls based on company policy, implement environmental controls and techniques, practice data security and secure storage disposal techniques</p> <p>J. Given a scenario: set up and configure a network with ports and protocols and proper cabling</p> <p>K. Implement appropriate backup techniques</p> <p>L. Troubleshoot and diagnose hardware,, software, network, storage, and security issues</p>
6373	PLTW - Computer Science A	Refer to PLTW
6372	PLTW - Computer Science Essentials	Refer to PLTW
6377	PLTW - Computer Science Principles	Refer to PLTW
6378	PLTW - Cybersecurity	Refer to PLTW

## Law, Public Safety, Corrections, and Security

Course Code	Course Name	Essential Standards
<b>Emergency and Fire Management Services</b>		
6514	Firefighter 1	The SC Fire Academy with SCDE OCTE input develops this course. The SC Fire Academy maintains curriculum. This course is also under SC LLR administration and as such all standards must be achieved to successful complete the courses and certifications.
6515	Firefighter 2	
<b>Law Enforcement Services</b>		
6505	Introduction to Law and Public Safety, Security and Corrections	<p><b>A. SAFETY</b></p> <ol style="list-style-type: none"> <li>1. Review school safety policies and procedures.</li> <li>2. Review classroom safety rules and procedures.</li> <li>3. Review safety procedures for using equipment in the classroom.</li> <li>4. Identify major causes of work-related accidents in office environments.</li> <li>5. Demonstrate safety skills in an office/work environment.</li> </ol> <p><b>B. STUDENT ORGANIZATIONS</b></p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTOS are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTOS.</li> <li>4. List leadership opportunities that are available to students through participation in CTOS conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTOS can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p><b>C. TECHNOLOGY KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</p> <p>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.</p> <p>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</p> <p>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</p> <p><b>D. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate punctuality.</li> <li>2. Demonstrate self-representation.</li> <li>3. Demonstrate work ethic.</li> <li>4. Demonstrate respect.</li> <li>5. Demonstrate time management.</li> <li>6. Demonstrate integrity.</li> <li>7. Demonstrate leadership.</li> <li>8. Demonstrate teamwork and collaboration.</li> <li>9. Demonstrate conflict resolution.</li> <li>10. Demonstrate perseverance.</li> <li>11. Demonstrate commitment.</li> <li>12. Demonstrate a healthy view of competition.</li> <li>13. Demonstrate a global perspective.</li> <li>14. Demonstrate health and fitness.</li> <li>15. Demonstrate self-direction.</li> <li>16. Demonstrate lifelong learning.</li> </ol> <p><b>E. PROFESSIONAL KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>4. Demonstrate job-specific mathematics skills.</p> <p>5. Demonstrate critical-thinking and problem-solving skills.</p> <p>6. Demonstrate creativity and resourcefulness.</p> <p>7. Demonstrate an understanding of business ethics.</p> <p>8. Demonstrate confidentiality.</p> <p>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</p> <p>10. Demonstrate diversity awareness.</p> <p>11. Demonstrate job acquisition and advancement skills.</p> <p>12. Demonstrate task management skills.</p> <p>13. Demonstrate customer-service skills.</p> <p><b>PART 1: LAW ENFORCEMENT</b></p> <p><b>F. HISTORY OF LAW ENFORCEMENT AND INTRODUCTION TO LAW ENFORCEMENT</b></p> <p>Effective law enforcement professionals demonstrate knowledge in the history of law as needed in their role. The following accountability criteria are considered essential for students in the law enforcement program of study.</p> <p><b>G. PERFORMING WORK SAFETY PRACTICES</b></p> <p>1. Apply safety policies and procedures (classroom and school).</p> <p>2. Keep a clean, orderly, safe work area.</p> <p>3. Operate a fire extinguisher.</p> <p>4. Demonstrate contagious and infectious disease protocols including personal protective equipment (PPE).</p> <p>5. Recognize and identify hazardous materials situations.</p> <p>6. Complete CPR certification. (optional)</p> <p>7. Complete 10-hour OSHA card/certification. (optional)</p> <p><b>H. DEMONSTRATING THE ABILITY TO COMMUNICATE (SOFT SKILLS) IN WRITTEN FORM</b></p> <p>1. Write an incident report.</p> <p>2. Write a traffic ticket.</p> <p>3. Write and execute a search/arrest warrant.</p>

Course Code	Course Name	Essential Standards
		<p>4. Complete Miranda waiver.</p> <p><b>I. COMMUNICATING (VERBALLY/NONVERBALLY) AND SOFT SKILLS</b></p> <ol style="list-style-type: none"> <li>1. Use telephone etiquette.</li> <li>2. Operate two-way radio.</li> <li>3. Conduct field interviews/street interviews.</li> <li>4. Testify in court.</li> <li>5. Apply active listening skills to obtain and clarify information provided in oral communications.</li> <li>6. Compare and contrast values and beliefs from a variety of cultures.</li> <li>7. Discuss the role that different values play in generating conflict.</li> <li>8. Identify ways to overcome communication and cultural barriers.</li> <li>9. Research cultural differences in relation to community policing.</li> <li>10. Discuss aspects of community-oriented policing.</li> <li>11. Practice workplace readiness skills, e.g., job interview.</li> </ol> <p><b>J. ANALYZING THE IMPACT OF THE U.S. CONSTITUTION ON CURRENT CRIMINAL JUSTICE AND PROTECTIVE SERVICES ISSUES</b></p> <ol style="list-style-type: none"> <li>1. Analyze U. S. Constitutional Amendments 1, 2, 4, 5, 6, 8, and 14 as they pertain to select United States Supreme Court cases.</li> <li>2. Examine recent U. S. Supreme Court decisions and discuss their impact on an individual's rights.</li> <li>3. Examine United States Constitutional rights as they apply to high school students, e.g. TLO versus New Jersey.</li> <li>4. Explain Castle Doctrine/Stand Your Ground law.</li> <li>5. Research case reviews, e.g., Terry v. Ohio; Weeks v. U.S.; Carroll v. U.S. “Carroll Doctrine”; Mapp v. Ohio; Tennessee v. Garner; Sibron v. New York; Gideon v. Wainwright; Brown v. Mississippi; Brown v. Board of Education of Topeka, Kansas; Miranda v. Arizona; Roper v. Simmons; Gregg v. Georgia.</li> </ol> <p><b>K. DEMONSTRATING UNDERSTANDING OF SOUTH CAROLINA LAW</b></p> <ol style="list-style-type: none"> <li>1. Distinguish between statutory, case, common, civil, and procedural law.</li> <li>2. Define the elements of a criminal law as defined by the South Carolina Code of Laws (murder, robbery, etc.).</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Apply the law to a given scenario.</p> <p>4. Define terminology related to criminal law, e.g., felony versus misdemeanor.</p> <p>5. Discuss juvenile law.</p> <p><b>L. DEMONSTRATING THE IMPORTANCE OF ETHICS, VALUES, AND PRINCIPLES IN CRIMINAL JUSTICE</b></p> <p>1. Apply ethical principles to practical problem situations as defined by Title 8 Chapter 13 of the South Carolina Code of Laws.</p> <p>2. Identify the four reasons officers commit violations of the law: anger, greed, lust, and peer pressure (according to the SC Criminal Justice Academy).</p> <p>3. Discuss social media and its significance as it relates to applying for a position in law enforcement, as well as maintaining employment as a law enforcement officer.</p> <p>4. Discuss discipline (in-house to criminal) and consequences.</p> <p><b>PART II: FIREFIGHTING</b></p> <p>NOTE: The following standards are based on the learning objectives listed in IFSTA’s Essentials of Fire Fighting, 6th Edition (2013), Stillwater, OK: Fire Protection Publications, Oklahoma State University. These objectives have been further modified by the South Carolina Fire Academy to meet the needs of the South Carolina fire service. In some cases, the numbering of the objectives may be different than in the SCFA curriculum and the textbook, but they address the same concepts and skills.</p> <p><b>UNIT A: CHAPTER 1—ORIENTATION AND FIRE SERVICE HISTORY</b></p> <p>1. Summarize the history and culture of the fire service. (N/A)</p> <p>2. Describe the mission and organizational characteristics of the fire service. (5.1.1)</p> <p>3. Identify the function of various fire company types and line functions in a fire department. (5.1.1)</p> <p>4. Explain fire service organizational principles. (5.1.1)</p> <p>5. Describe the function of fire department regulations and standard operating procedures. (5.1.1)</p> <p>6. Identify external organizations likely to interact with fire departments. (5.1.1)</p> <p><b>UNIT B: CHAPTER 2—FIREFIGHTER SAFETY AND HEALTH</b></p> <p><b>UNIT</b></p> <p>1. List the main types of job-related firefighter fatalities, injuries, and illnesses. (5.1.1)</p> <p>2. Recognize the impact of firefighter fatalities on associated groups of people. (CTBS*)</p>

Course Code	Course Name	Essential Standards
		<p>3. Describe the NFPA and OSHA standards and regulations related to firefighter safety and health. (5.1.1)</p> <p>4. Summarize the model that supports the concept of risk management. (5.1.1)</p> <p>5. Describe the 16 Life Safety Initiatives and their importance. (CTBS*)</p> <p>6. Describe fire department safety and health programs and awareness issues. (5.1.1)</p> <p>7. Mount and dismount an apparatus. [Skill Sheet 2.1] (5.3.2, 5.3.3)</p> <p>8. Describe ways to help prevent accidents and injuries in fire stations and facilities. (5.1.1)</p> <p>9. Explain general guidelines for tool and equipment safety. (5.3.4)</p> <p>10. Describe ways to maintain safety in training. (5.1.1)</p> <p>11. State the practices a Firefighter I uses for emergency scene preparedness and safety. (5.1.1., 5.3.3).</p> <p>12. Perform scene management at a roadway incident. [Skill Sheet 2.2] (5.3.2)</p> <p>13. Explain the importance of personnel accountability. (5.3.5)</p> <p>*Added to meet NFFF Courage to Be Safe objectives.</p> <p><b>UNIT C: CHAPTER 3—FIRE DEPARTMENT COMMUNICATIONS</b></p> <p>1. Describe the information required to dispatch emergency services. (5.2.1, 5.2.2, 5.2.3)</p> <p>2. Handle emergency and non-emergency calls. [Skill Sheet 3.1] (5.2.1, 5.2.2)</p> <p>3. Describe the systems used for internal communications. (5.2.1, 5.2.2)</p> <p>4. Explain radio limitations that may impact internal communications. (5.2.3)</p> <p>5. Use a portable radio for routine and emergency communications. [Skill Sheet 3.2] (5.2.1, 5.2.3)</p> <p><b>UNIT D: CHAPTER 6—FIREFIGHTER PERSONAL PROTECTIVE EQUIPMENT</b></p> <p>1. Describe the purpose of personal protective equipment. (5.1.1, 5.3.3)</p> <p>2. Describe characteristics of each type of personal protective equipment. (5.3.2, 5.3.3)</p> <p>3. Summarize guidelines for the care of personal protective clothing. (5.1.1, 5.3.3, 5.5.1)</p> <p>4. Explain safety considerations for personal protective equipment. (5.3.1, 5.3.3)</p> <p>5. Identify respiratory hazards and types of respiratory protection equipment. (5.3.1)</p> <p>6. Identify the components of an SCBA. (5.3.1)</p> <p>7. Describe the limitations of respiratory protection equipment. (5.3.1)</p> <p>8. Don and doff PPE and free-standing and vehicle-mounted protective breathing apparatus. [Skill Sheets 6.1-6.4]</p>

Course Code	Course Name	Essential Standards
		<p>6.1: Don personal protective clothing. (5.1.2, 5.3.1, 5.3.2, 5.3.3)</p> <p>6.2: Don PPE/SCBA for use at an emergency. (5.3.1, 5.3.2, 5.3.3)</p> <p>6.3: Don SCBA while seated. (5.3.1, 5.3.2, 5.3.3)</p> <p>6.4: Doff personal protective equipment. (5.1.2, 5.3.2, 5.3.3)</p> <p>9. Inspect and demonstrate proper care for protective breathing apparatus. [Skill Sheet 6.5]</p> <p>6.5: Inspect an SCBA. (5.3.2, 5.5.1)</p> <p>10. Summarize safety precautions for refilling SCBA cylinders. (5.5.1)</p> <p>11. Change an SCBA cylinder. [Skill Sheet 6.6] (5.3.1)</p> <p>12. Explain safety precautions for SCBA use. (5.3.1)</p> <p>13. Describe non-emergency and emergency exit indicators and techniques. (5.3.1)</p> <p><b>UNIT E: CHAPTER 4—BUILDING CONSTRUCTION</b></p> <p>1. Describe the impact of fire on common building materials and classifications and their potential hazards to firefighters. (5.3.4, 5.3.10, 5.3.12)</p> <p>2. List the main types of occupancy classifications. (N/A)</p> <p>3. Describe the basic construction of building components. (5.3.4, 5.3.10, 5.3.12)</p> <p><b>UNIT F: CHAPTER 5—FIRE BEHAVIOR</b></p> <p>1. Explain the science of fire as it relates to energy, forms of ignition, and modes of combustion. (5.3.11)</p> <p>2. Describe the impact of thermal energy on heat, temperature, and heat transfer. (5.3.12)</p> <p>3. Recognize the physical states of fuel. (5.3.10)</p> <p>4. Explain the relationship between oxygen and life safety. (5.3.11)</p> <p>5. Identify the products of self-sustained chemical reactions. (5.3.11)</p> <p>6. Explain the factors that affect fire development. (5.3.11)</p> <p>7. Describe the stages of fire development. (5.3.11)</p> <p>8. Recognize signs, causes, and effects of rapid fire development. (5.3.11)</p> <p>9. Describe the methods through which firefighting operations can influence fire behavior. (5.3.11, 5.3.12)</p> <p><b>UNIT G: CHAPTER 7—PORTABLE FIRE EXTINGUISHERS</b></p> <p>1. Explain portable fire extinguisher classifications. (5.3.16)</p> <p>2. Describe types of portable fire extinguishers. (5.3.16)</p> <p>3. Define the ratings in a portable fire extinguisher rating system. (5.3.16)</p>

Course Code	Course Name	Essential Standards
		<p>4. Explain the considerations taken when selecting and using portable fire extinguishers. (5.3.16)</p> <p>5. Operate a pressured-water extinguisher. [Skill Sheet 7.1] (5.3.16)</p> <p>6. Identify procedures used for the inspection, care, and maintenance of portable fire extinguishers. (5.3.16, 5.5.1)</p> <p><b>UNIT H: CHAPTER 8—ROPES, WEBBING, AND KNOTS</b></p> <p>Effective firefighting professionals demonstrate knowledge and usage of ropes, webbings, and knots as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <ol style="list-style-type: none"> <li>1. Compare and contrast the characteristics of life safety rope and utility rope. (5.3.20)</li> <li>2. Summarize basic guidelines for rope maintenance. (5.5.1)</li> <li>3. Perform an inspection, clean, and store rope. [Skill Sheet 8.1] (5.5.1)</li> <li>4. Describe webbing and webbing construction. (5.3.20)</li> <li>5. Describe parts of a rope and considerations in tying a knot. (5.1.2, 5.3.20)</li> <li>6. Tie knots commonly used in the fire service. [Skill Sheets 8.2-8.10] <ol style="list-style-type: none"> <li>8.2: Tie an overhand knot. (5.3.20)</li> <li>8.3: Tie a bowline knot. (5.3.20)</li> <li>8.4: Tie a clove hitch. (5.3.20)</li> <li>8.5: Tie a clove hitch around an object. (5.3.20)</li> <li>8.6: Tie a figure-eight knot. (5.3.20)</li> <li>8.7: Tie a figure-eight bend. (5.3.20)</li> <li>8.8: Tie a figure-eight on a bight. (5.3.20)</li> <li>8.9: Tie a figure-eight follow through. (5.3.20)</li> <li>8.10: Tie a water knot. (5.3.20)</li> </ol> </li> <li>7. Describe knot characteristics and knot elements. (5.1.2, 5.3.20)</li> <li>8. Select commonly used rope hardware for specific applications. (5.1.2, 5.3.20)</li> <li>9. Summarize hoisting safety considerations. (5.1.2, 5.3.20)</li> <li>10. Hoist tools and equipment. [Skill Sheets 8.11-8.14] (5.5.1) <ol style="list-style-type: none"> <li>8.11: Hoist an axe. (5.1.2, 5.3.20)</li> <li>8.12: Hoist a pike pole. (5.1.2, 5.3.20)</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<p>8.13: Hoist a dry hoseline. (5.1.2, 5.3.20)</p> <p>8.14: Hoist a charged hoseline. (5.1.2, 5.3.20)</p> <p><b>UNIT I: CHAPTER 9 – STRUCTURAL SEARCH, VICTIM REMOVAL, AND FIREFIGHTER SURVIVAL</b></p> <p>1. Summarize the impact of building construction and floor plans on structural search techniques. (5.3.9)</p> <p>2. Explain size-up and situational awareness considerations during structural searches. (5.3.9)</p> <p>3. Summarize safety guidelines for structural search and rescue. (5.3.9)</p> <p>4. Recognize and explain primary and secondary search techniques. (5.3.9)</p> <p>5. Perform a primary and secondary search. [Skill Sheets 9.1-9.2]</p> <p>9.1: Perform a primary search. (5.3.9)</p> <p>9.2: Perform a secondary search. (5.3.9)</p> <p>6. Describe victim removal methods. (5.3.5, 5.3.9)</p> <p>7. Explain firefighter survival methods and actions that are needed. (5.3.1)</p> <p>8. Describe the actions of a rapid intervention crew or team (RIT/RIC) when locating a downed firefighter. (5.3.9)</p> <p>9. Demonstrate rescue drags and carries for one and two rescuers. [Skill Sheets 9.3-9.4]</p> <p>9.3: Perform a webbing drag. (5.3.9)</p> <p>11.6: Force entry through a padlock. (5.3.4, 5.3.14)</p> <p>8. Explain considerations when forcing entry through various types of windows and covers.</p> <p>9. Force entry through a window. [Skill Sheet 11.7]</p> <p>10. Describe forcible entry methods for breaching walls. (5.3.4, 5.3.14)</p> <p>11. Explain forcible entry methods for breaching floors. (5.3.4, 5.3.14)</p> <p><b>UNIT L: CHAPTER 12 – GROUND LADDERS</b></p> <p>1. Describe the construction and identify the parts of ground ladders. (5.3.6)</p> <p>2. Recognize the types of ladders used in the fire service. (5.3.6)</p> <p>3. Clean, inspect, and maintain a ladder. [Skill Sheet 12.1] (5.5.1)</p> <p>4. Explain safety considerations when selecting, lifting, and lowering a ladder. (5.3.6)</p> <p>5. Perform various ladder carries and raises. [Skill Sheets 12.2-12.5]</p> <p>12.2: Perform a one-firefighter ladder raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.3: Perform a two-firefighter carry and flat raise. (5.3.6, 5.3.11, 5.3.12)</p>

Course Code	Course Name	Essential Standards
		<p>12.4: Perform a two-firefighter carry and beam raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.5: Deploy a roof ladder. (5.3.11, 5.3.12)</p> <p>6. Demonstrate procedures for moving and placing a ground ladder. [Skill Sheet 12.6]</p> <p>7. Explain the methods used to secure ladders. (5.3.6)</p> <p>8. Describe ladder climbing considerations. (5.3.6)</p> <p>9. Remove and assist victims down a ladder. [Skill Sheets 12.7-12.9]</p> <p>12.7: Leg lock on a ground ladder. (5.3.11, 5.3.12)</p> <p>12.8: Assist a conscious victim down a ground ladder. (5.3.9)</p> <p>12.9: Assist an unconscious victim down a ground ladder. (5.3.9)</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>1. Describe reasons for tactical ventilation. (5.3.11)</p> <p>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12) □ 11.6: Force entry through a padlock. (5.3.4, 5.3.14)</p> <p>8. Explain considerations when forcing entry through various types of windows and covers.</p> <p>9. Force entry through a window. [Skill Sheet 11.7]</p> <p>10. Describe forcible entry methods for breaching walls. (5.3.4, 5.3.14)</p> <p>11. Explain forcible entry methods for breaching floors. (5.3.4, 5.3.14)</p> <p><b>UNIT L: CHAPTER 12 – GROUND LADDERS</b></p> <p>1. Describe the construction and identify the parts of ground ladders. (5.3.6)</p> <p>2. Recognize the types of ladders used in the fire service. (5.3.6)</p> <p>3. Clean, inspect, and maintain a ladder. [Skill Sheet 12.1] (5.5.1)</p> <p>4. Explain safety considerations when selecting, lifting, and lowering a ladder. (5.3.6)</p> <p>5. Perform various ladder carries and raises. [Skill Sheets 12.2-12.5]</p> <p>12.2: Perform a one-firefighter ladder raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.5: Deploy a roof ladder. (5.3.11, 5.3.12)</p> <p>6. Demonstrate procedures for moving and placing a ground ladder. [Skill Sheet 12.6]</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>Effective firefighting professionals demonstrate appropriate tactical ventilation techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <p>1. Describe reasons for tactical ventilation. (5.3.11)</p>

Course Code	Course Name	Essential Standards
		<p>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12)7. Explain the methods used to secure ladders. (5.3.6)</p> <p>8. Describe ladder climbing considerations. (5.3.6)</p> <p>9. Remove and assist victims down a ladder. [Skill Sheets 12.7-12.9]</p> <p>12.7: Leg lock on a ground ladder. (5.3.11, 5.3.12)</p> <p>12.8: Assist a conscious victim down a ground ladder. (5.3.9)</p> <p>12.9: Assist an unconscious victim down a ground ladder. (5.3.9)</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>Effective firefighting professionals demonstrate appropriate tactical ventilation techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <p>1. Describe reasons for tactical ventilation. (5.3.11)</p> <p>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12)12.5: Deploy a roof ladder. (5.3.11, 5.3.12)</p> <p>6. Demonstrate procedures for moving and placing a ground ladder. [Skill Sheet 12.6]</p> <p>7. Explain the methods used to secure ladders. (5.3.6)</p> <p>8. Describe ladder climbing considerations. (5.3.6)</p> <p>9. Remove and assist victims down a ladder. [Skill Sheets 12.7-12.9]</p> <p>12.7: Leg lock on a ground ladder. (5.3.11, 5.3.12)</p> <p>12.8: Assist a conscious victim down a ground ladder. (5.3.9)</p> <p>12.9: Assist an unconscious victim down a ground ladder. (5.3.9)</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>Effective firefighting professionals demonstrate appropriate tactical ventilation techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <p>1. Describe reasons for tactical ventilation. (5.3.11)</p> <p>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12)</p> <p>12.3: Perform a two-firefighter carry and flat raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.4: Perform a two-firefighter carry and beam raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.5: Deploy a roof ladder. (5.3.11, 5.3.12)</p> <p>6. Demonstrate procedures for moving and placing a ground ladder. [Skill Sheet 12.6]</p>

Course Code	Course Name	Essential Standards
		<p>7. Explain the methods used to secure ladders. (5.3.6)</p> <p>8. Describe ladder climbing considerations. (5.3.6)</p> <p>9. Remove and assist victims down a ladder. [Skill Sheets 12.7-12.9]</p> <p>12.7: Leg lock on a ground ladder. (5.3.11, 5.3.12)</p> <p>12.8: Assist a conscious victim down a ground ladder. (5.3.9)</p> <p>12.9: Assist an unconscious victim down a ground ladder. (5.3.9)</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>Effective firefighting professionals demonstrate appropriate tactical ventilation techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <p>1. Describe reasons for tactical ventilation. (5.3.11)</p> <p>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12)</p> <p><b>UNIT L: CHAPTER 12 – GROUND LADDERS</b></p> <p>Effective firefighting professionals demonstrate appropriate ground ladder techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <p>1. Describe the construction and identify the parts of ground ladders. (5.3.6)</p> <p>2. Recognize the types of ladders used in the fire service. (5.3.6)</p> <p>3. Clean, inspect, and maintain a ladder. [Skill Sheet 12.1] (5.5.1)</p> <p>4. Explain safety considerations when selecting, lifting, and lowering a ladder. (5.3.6)</p> <p>5. Perform various ladder carries and raises. [Skill Sheets 12.2-12.5]</p> <p>12.2: Perform a one-firefighter ladder raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.3: Perform a two-firefighter carry and flat raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.4: Perform a two-firefighter carry and beam raise. (5.3.6, 5.3.11, 5.3.12)</p> <p>12.5: Deploy a roof ladder. (5.3.11, 5.3.12)</p> <p>6. Demonstrate procedures for moving and placing a ground ladder. [Skill Sheet 12.6]</p> <p>7. Explain the methods used to secure ladders. (5.3.6)</p> <p>8. Describe ladder climbing considerations. (5.3.6)</p> <p>9. Remove and assist victims down a ladder. [Skill Sheets 12.7-12.9]</p> <p>12.7: Leg lock on a ground ladder. (5.3.11, 5.3.12)</p> <p>12.8: Assist a conscious victim down a ground ladder. (5.3.9)</p>

Course Code	Course Name	Essential Standards
		<p>12.9: Assist an unconscious victim down a ground ladder. (5.3.9)</p> <p><b>UNIT M: CHAPTER 13 – TACTICAL VENTILATION</b></p> <p>Effective firefighting professionals demonstrate appropriate tactical ventilation techniques as needed in their role. The following accountability criteria are considered essential for students in the firefighting program of study.</p> <ol style="list-style-type: none"> <li>1. Describe reasons for tactical ventilation. (5.3.11)</li> <li>2. Identify considerations that affect the decision to ventilate. (5.3.11, 5.3.12)</li> </ol> <p>"</p>
6510	Law Enforcement Services 1	<p><b>F. UNIT 1: HISTORY OF LAW ENFORCEMENT AND INTRODUCTION TO LAW ENFORCEMENT</b></p> <p><b>G. UNIT 2: PERFORMING WORK SAFETY PRACTICES</b></p> <ol style="list-style-type: none"> <li>1. Apply safety policies and procedures (classroom and school).</li> <li>2. Keep a clean, orderly, safe work area.</li> <li>3. Operate a fire extinguisher.</li> <li>4. Demonstrate contagious and infectious disease protocols including personal protective equipment (PPE).</li> <li>5. Recognize and identify hazardous materials situations.</li> <li>6. Complete CPR certification. (optional)</li> <li>7. Complete 10-hour OSHA card/certification. (optional)</li> </ol> <p><b>H. UNIT 3: DEMONSTRATING THE ABILITY TO COMMUNICATE (SOFT SKILLS) IN WRITTEN FORM</b></p> <p>Effective law enforcement professionals demonstrate appropriate written communications skills as needed in their role. The following accountability criteria are considered essential for students in the law enforcement program of study.</p> <ol style="list-style-type: none"> <li>1. Write an incident report.</li> <li>2. Write a traffic ticket.</li> <li>3. Write and execute a search/arrest warrant.</li> <li>4. Complete Miranda waiver.</li> </ol> <p><b>I. UNIT 4: COMMUNICATING (VERBALLY/NONVERBALLY) AND SOFT SKILLS</b></p> <ol style="list-style-type: none"> <li>1. Use telephone etiquette.</li> <li>2. Operate two-way radio.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Conduct field interviews/street interviews.</p> <p>4. Testify in court.</p> <p>5. Apply active listening skills to obtain and clarify information provided in oral communications.</p> <p>6. Compare and contrast values and beliefs from a variety of cultures.</p> <p>7. Discuss the role that different values play in generating conflict.</p> <p>8. Identify ways to overcome communication and cultural barriers.</p> <p>9. Research cultural differences in relation to community policing.</p> <p>10. Discuss aspects of community-oriented policing.</p> <p>11. Practice workplace readiness skills, e.g., job interview.</p> <p><b>J. UNIT 5: ANALYZING THE IMPACT OF THE U.S. CONSTITUTION ON CURRENT CRIMINAL JUSTICE AND PROTECTIVE SERVICES ISSUES</b></p> <p>1. Analyze U. S. Constitutional Amendments 1, 2, 4, 5, 6, 8, and 14 as they pertain to select United States Supreme Court cases.</p> <p>2. Examine recent U. S. Supreme Court decisions and their impact on an individual's rights.</p> <p>3. Examine United States Constitutional rights as they apply to high school students, e.g. TLO versus New Jersey.</p> <p>4. Explain Castle Doctrine/Stand Your Ground law.</p> <p>5. Research case reviews, e.g., Terry v. Ohio; Weeks v. U.S.; Carroll v. U.S. “Carroll Doctrine”; Mapp v. Ohio; Tennessee v. Garner; Sibron v. New York; Gideon v. Wainwright; Brown v. Mississippi; Brown v. Board of Education of Topeka, Kansas; Miranda v. Arizona; Roper v. Simmons; Gregg v. Georgia.</p> <p><b>K. UNIT 6: DEMONSTRATING UNDERSTANDING OF SOUTH CAROLINA LAW</b></p> <p>1. Distinguish between statutory, case, common, civil, and procedural law.</p> <p>2. Define the elements of a criminal law as defined by the South Carolina Code of Laws (murder, robbery, etc.).</p> <p>3. Apply the law to a given scenario.</p> <p>4. Define terminology related to criminal law, e.g., felony versus misdemeanor.</p> <p>5. Discuss juvenile law.</p> <p><b>L. UNIT 7: DEMONSTRATING THE IMPORTANCE OF ETHICS, VALUES, AND PRINCIPLES IN CRIMINAL JUSTICE</b></p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Apply ethical principles to practical problem situations as defined by Title 8 Chapter 13 of the South Carolina Code of Laws.</li> <li>2. Identify the four reasons officers commit violations of the law: anger, greed, lust, and peer pressure (according to the SC Criminal Justice Academy).</li> <li>3. Discuss social media and its significance as it relates to applying for a position in law enforcement, as well as maintaining employment as a law enforcement officer.</li> <li>4. Discuss discipline (in-house to criminal) and consequences.</li> </ol> <p><b>M. UNIT 8: UNDERSTANDING USE OF FORCE CONTINUUM</b></p> <ol style="list-style-type: none"> <li>1. State the level of force used for the level of resistance and the de-escalation of force.</li> <li>2. Identify when medical attention is required.</li> <li>3. Identify legal components to use of force continuum.</li> <li>4. Describe special uses of force with mental and/or physical disabilities.</li> <li>5. Participate in shoot-don't shoot practical exercises.</li> <li>6. Demonstrate an understanding of ability, opportunity, and jeopardy.</li> </ol> <p><b>N. UNIT 9: PHYSICAL AND EMOTIONAL HEALTH OF THE LAW ENFORCEMENT OFFICER</b></p> <ol style="list-style-type: none"> <li>1. Perform physical fitness exercises and/or agility drills on a regular basis.</li> <li>2. Demonstrate understanding of proper nutritional habits.</li> <li>3. Identify impact of stress on physical health in law enforcement.</li> <li>4. Identify positive impact of physical exercise on long-term health benefits.</li> <li>5. Identify positive strategies for dealing with stress.</li> <li>6. Participate in the South Carolina Criminal Justice Academy physical fitness test. (optional)</li> </ol> <p><b>O. UNIT 10: DISTINGUISHING BETWEEN FEDERAL, STATE, AND LOCAL AGENCIES (PROCEDURAL)</b></p> <ol style="list-style-type: none"> <li>1. Explain the establishment of law enforcement in the United States.</li> <li>2. Identify federal agencies.</li> <li>3. Identify state agencies.</li> <li>4. Identify local agencies.</li> <li>5. Identify jurisdictions and responsibilities."</li> </ol>

Course Code	Course Name	Essential Standards
6511	Law Enforcement Services 2	<p>F. UNIT 11: DEMONSTRATING UNDERSTANDING OF PATROL PROCEDURES</p> <ol style="list-style-type: none"> <li>1. Demonstrate understanding of organizational structure and chain of command.</li> <li>2. Demonstrate understanding of roll call and patrol preparation.</li> <li>3. Demonstrate understanding and purpose of standard operating procedures.</li> <li>4. Demonstrate understanding of apprehension, transportation, and incarceration of suspect (adult and juvenile).</li> <li>5. Identify mental health concerns.</li> </ol> <p>G. UNIT 12: DEMONSTRATING THE ABILITY TO APPLY ACCEPTED LAW ENFORCEMENT TACTICS</p> <ol style="list-style-type: none"> <li>1. Demonstrate proper positioning (body, vehicle, and equipment) in a given scenario.</li> <li>2. Demonstrate how to respond to a crime in progress given a scenario.</li> <li>3. Demonstrate how to conduct a vehicle search.</li> <li>4. Demonstrate a building entry and search.</li> <li>5. Demonstrate how to transport a suspect/prisoner.</li> <li>6. Demonstrate the difference between a Terry stop/frisk and consensual encounter.</li> <li>7. Demonstrate the difference between reasonable suspicion and probable cause.</li> <li>8. Demonstrate handcuffing techniques.</li> <li>9. Demonstrate a search incident to arrest.</li> </ol> <p>H. UNIT 13: DEMONSTRATING TECHNIQUES USED IN VEHICLE OPERATIONS AND TRAFFIC STOPS</p> <ol style="list-style-type: none"> <li>1. Demonstrate an understanding of defensive driving in law enforcement.</li> <li>2. Define the three emergency code responses.</li> <li>3. Demonstrate an unknown risk traffic stop.</li> <li>4. Demonstrate a high-risk traffic stop.</li> <li>5. Demonstrate high- and unknown-risk traffic stops with multiple officers, suspects, and vehicles.</li> <li>6. Demonstrate how to direct traffic.</li> <li>7. Demonstrate legal requirements for a DUI arrest.</li> </ol> <p>I. UNIT 14: EXPLAINING HOW TO PROTECT AND DOCUMENT A CRIME SCENE</p> <ol style="list-style-type: none"> <li>1. Demonstrate knowledge and skill in responding to, securing, and preserving a crime scene.</li> <li>2. Identify the responsibilities of the coroner and EMS at a crime scene.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Describe standard practices for preserving a crime scene.</p> <p>4. Discuss available standard search procedure options, e.g., grid, spiral, lane, quadrants.</p> <p>5. Explain the difference between collecting evidence with and without a forensic unit.</p> <p>6. Describe the chain of custody and legal requirements for use of evidence at trial.</p> <p>7. Discuss crime scene photographs, sketches, and documentation.</p> <p><b>J. UNIT 15: DEMONSTRATING KNOWLEDGE OF COMMONLY ABUSED SUBSTANCES</b></p> <p>1. Identify commonly abused substances (legal and illegal).</p> <p>2. Describe the physical and psychological changes associated with specific substances.</p> <p>3. Describe the impact substance abuse has on families and coworkers.</p> <p>4. Demonstrate knowledge of penalties for possession and/or distribution of certain controlled substances.</p> <p>5. Identify the dangers of substance abuse in combination with mental impairments/disabilities.</p> <p>6. Identify the components and dangers of clandestine laboratories.</p> <p><b>K. UNIT 16: DEMONSTRATING KNOWLEDGE OF CRIMINAL COURT PROCEDURES (ADULT)</b></p> <p>1. Identify the steps in a criminal procedure from arrest to conviction.</p> <p>2. Identify the different courts and their jurisdictions.</p> <p>3. Identify the roles of the courtroom work group.</p> <p>4. Demonstrate knowledge of appearance, presentation of testimony, and case preparation.</p> <p><b>L. UNIT 17: DEMONSTRATING KNOWLEDGE OF JUVENILE PROCEDURES</b></p> <p>1. Identify the steps in a criminal procedure from detention to adjudication.</p> <p>2. Discuss the role of the SC Department of Social Services and emergency protective custody (EPC).</p> <p>3. Demonstrate an understanding of family court, Department of Juvenile Justice, and their jurisdictions.</p> <p>4. Demonstrate knowledge of appearance, presentation of testimony, and case preparation.</p> <p><b>M. UNIT 18: DOMESTIC AND INTERNATIONAL TERRORISM</b></p> <p>1. Discuss qualifiers to identifying a terrorist (international vs. domestic terrorism).</p> <p>2. Discuss the history of terrorism.</p>

Course Code	Course Name	Essential Standards
		3. Discuss terrorism cases, e.g., 9/11, Oklahoma City, Boston Marathon."
<b>Paralegal Systems Technology</b>		
6526	Legal Systems Technology 1	G. Document Preparation H. Legal Administration Support Functions J. Legal Communication, K. Telephone Techniques L. Filing/Records Management M. Mail Services and Procedures N. Financial Functions O. Management Functions
6527	Legal Systems Technology 2	F. Career Exploration G. Legal Timekeeping and Billing H. Docket Control I. Electronic Discovery K. Computer-Assisted Legal Research and E-mail L. The Electronic Courthouse and the Automated Courtroom

## Manufacturing Cluster

Course Code	Course Name	Essential Standards
<b>Electronics Technology</b>		
6133	Electronics Technology 1	<p><b>A. STUDENT ORGANIZATIONS</b></p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p><b>B. TECHNOLOGY KNOWLEDGE</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> <li>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.</li> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> <li>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>C. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS</p> <ol style="list-style-type: none"> <li>1. Demonstrate punctuality.</li> <li>2. Demonstrate self-representation.</li> <li>3. Demonstrate work ethic.</li> <li>4. Demonstrate respect.</li> <li>5. Demonstrate time management.</li> <li>6. Demonstrate integrity.</li> <li>7. Demonstrate leadership.</li> <li>8. Demonstrate teamwork and collaboration.</li> <li>9. Demonstrate conflict resolution.</li> <li>10. Demonstrate perseverance.</li> <li>11. Demonstrate commitment.</li> <li>12. Demonstrate a healthy view of competition.</li> <li>13. Demonstrate a global perspective.</li> <li>14. Demonstrate health and fitness.</li> <li>15. Demonstrate self-direction.</li> <li>16. Demonstrate lifelong learning.</li> </ol> <p>D. PROFESSIONAL KNOWLEDGE</p> <ol style="list-style-type: none"> <li>1. Demonstrate effective speaking and listening skills.</li> <li>2. Demonstrate effective reading and writing skills.</li> <li>3. Demonstrate mathematical reasoning.</li> <li>4. Demonstrate job-specific mathematics skills.</li> <li>5. Demonstrate critical-thinking and problem-solving skills.</li> <li>6. Demonstrate creativity and resourcefulness.</li> <li>7. Demonstrate an understanding of business ethics.</li> <li>8. Demonstrate confidentiality.</li> <li>9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.</li> <li>10. Demonstrate diversity awareness.</li> <li>11. Demonstrate job acquisition and advancement skills.</li> <li>12. Demonstrate task management skills.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>13. Demonstrate customer-service skills.</p> <p><b>E. SOLDERING AND ASSEMBLING TECHNIQUES</b></p> <ol style="list-style-type: none"> <li>1. Select and maintain soldering and desoldering tools.</li> <li>2. Solder and desolder components.</li> <li>3. Select and install connection devices (e.g., terminal, lug, crimp, spade).</li> </ol> <p><b>NCCER® CORE MODULES (EMBEDDED THROUGHOUT THE PROGRAM)</b></p> <p><b>F. SAFETY</b></p> <ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsman.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> <li>11. Define safe work procedures around electrical hazards.</li> <li>12. Complete 10-hour OSHA course/assessment and receive card. (Optional)</li> <li>13. Complete Performance Tasks</li> </ol> <p><b>L. BASIC COMMUNICATION SKILLS (SDE Requirement)</b></p> <ol style="list-style-type: none"> <li>1. Describe the communication, listening and speaking processes and their relationship to job performance.</li> <li>2. Describe good reading and writing skills and their relationship to job performance</li> <li>3. Demonstrate telephone and e-communication skills necessary in the workplace.</li> <li>4. Complete Performance Tasks.</li> </ol> <p><b>M. BASIC EMPLOYABILITY SKILLS (SDE Requirement)</b></p> <ol style="list-style-type: none"> <li>1. Describe the opportunities in the construction business and how an individual enters the construction workforce.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>2. Explain the importance of critical thinking and how to solve problems in the workplace.</p> <p>3. Explain the importance of social skills and identify ways good social skills are applied in the construction trade.</p> <p>4. Describe computer systems and their industry applications.</p> <p>5. Explain interpersonal relationship skills, self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.</p> <p><b>P. DIRECT CURRENT (DC) ELECTRONICS</b></p> <p>1. Define voltage and identify the ways in which it can be produced.</p> <p>2. Identify materials as either conductors, semiconductors, or insulators.</p> <p>3. Identify electronic components and their schematic symbols utilizing existing codes and notations (e.g., color codes and exponential notation).</p> <p>4. Interpret schematic, block, and pictorial diagrams.</p> <p>5. Apply Ohm's law in solving DC electronic problems.</p> <p>6. Apply Watt's law in solving DC electronic power problems.</p> <p>7. Apply Kirchhoff's laws in solving DC electronic problems.</p> <p>8. Evaluate and test DC series circuits.</p> <p>9. Evaluate and test DC parallel circuits.</p> <p>10. Evaluate and test DC series-parallel circuits.</p> <p>11. Evaluate and test sources of DC signals and power.</p> <p>12. Evaluate and test DC resistive devices.</p> <p>13. Evaluate and test circuit controls (e.g., switches, fuses, circuit breakers, relays).</p> <p>14. Demonstrate proper use of test equipment.</p>
6134	Electronics Technology 2	<p><b>Q. ALTERNATING CURRENT (AC) ELECTRONICS</b></p> <p>1. Calculate the peak, effective, and RMS voltage or current values for an AC waveform.</p> <p>2. Identify electronic components and their schematic symbols.</p> <p>3. Interpret schematic, block, and pictorial diagrams.</p> <p>4. Solve AC electronics problems involving current, voltage, resistance, reactance, impedance, and power.</p>

Course Code	Course Name	Essential Standards
		5. Describe the function and operation of capacitors in AC circuits. 6. Describe the function and operation of inductors in AC circuits. 7. Describe the function and operation of RC, RL, and RLC circuits. 8. Calculate the phase relationship between two AC waveforms. 9. Describe the function and operation of transformers. 10. Demonstrate proper use of test equipment.
6135	Electronics Technology 3	<b>R. SEMICONDUCTOR DEVICES</b> 1. Identify electronic components and their schematic symbols. 2. Interpret schematic, block, and pictorial diagrams. 3. Describe the function and operation of semiconductor devices. 4. Describe the functions and operations of diode circuits, rectifiers, and transistor amplifiers. 5. Demonstrate techniques for handling and replacing semiconductors. 6. Describe the function and operation of operational amplifiers. 7. Construct circuits using semiconductor devices. 8. Describe and connect rectifiers, LEDs, SCRs, and solid-state relays. 9. Demonstrate proper use of test equipment.
6136	Electronics Technology 4	<b>S. DIGITAL ELECTRONICS</b> 1. Identify and convert number systems: binary, octal, decimal, hexadecimal, and binary coded decimal. 2. Identify electronic components and their schematic symbols. 3. Interpret schematic, block, and pictorial diagrams. 4. Interpret and develop truth tables and Boolean expressions of logic circuits. 5. Test the operation of logic gates. 6. Test the operation of clock and timing circuits. 7. Build and test combinational logic circuits for a given application. 8. Test counter and controller circuits for sequential logic applications. 9. Interpret information on integrated circuits (IC) data and specification sheets.

Course Code	Course Name	Essential Standards
		10. Test the operation of analog to digital (A/D) and digital to analog (D/A) converters. 11. Demonstrate proper use of test equipment.
6045	Introduction/Intermediate to Manufacturing Technology	<p>"The course standards have been updated and will be posted for school yuear 2021-2020. Essential Standard will consist of at a minimum of the first two modules of Manufacturing Skills Standards Certification. Either Microburst employability skills or SkillsUSA Career Essentials. Pre Test will be provided by instructor and Post test by MSSC.</p> <p>Current Standards:</p> <p>6. Demonstrate knowledge of correct and incorrect approval procedures to document inspection results.</p> <p>7. Demonstrate knowledge of procedures for recording and storing product history and maintaining records.</p> <p>8. Demonstrate knowledge of how to use route sheets and statistical method charts to document process.</p> <p>9. Demonstrate knowledge of follow-up and reporting documentation procedures to ensure proper communications.</p> <p><b>UNIT M: BASIC MEASUREMENT</b></p> <p>1. Convert measurements in U.S. measurement and standard international metrics systems.</p> <p>2. Demonstrate measuring parts using a machinist's rule.</p> <p>3. Demonstrate measuring parts using a tape measure.</p> <p>4. Demonstrate measuring parts using dial and digital calipers.</p> <p>5. Demonstrate measuring parts using a micrometer.</p> <p>6. Demonstrate measuring parts using a dial indicator.</p> <p>7. Demonstrate collecting measurement data from a digital gauge using a computer.</p> <p><b>MANUFACTURING PROCESSES &amp; PRODUCTION</b></p> <p><b>UNIT N: Identify customer needs</b></p> <p>a. Recognize the different and common needs of internal and external customers</p> <p>b. Maintain customer contact about product aspects and printed specifications to ensure understanding of needs</p>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>c. Review customer needs on a regular basis</li> <li>d. Ensure customer specifications are up to date</li> <li>e. Communicate customer needs to others including shift to shift, coworkers and managers</li> <li>f. Address issues preventing customer needs from being met</li> <li>2. Determine resources available for the production process               <ul style="list-style-type: none"> <li>a. Check raw materials against work orders</li> <li>b. Check tools and equipment against work orders</li> <li>c. Communicate discrepancies to the proper parties</li> <li>d. Ensure that necessary resources are available at workstation</li> <li>e. Schedule workers with appropriate skills according to production needs</li> <li>f. Use advanced technologies to increase productivity</li> </ul> </li> <li>3. Set up and verify equipment for the production process               <ul style="list-style-type: none"> <li>a. Make proper repairs and adjustments to production equipment prior to putting into service</li> <li>b. Ensure setup meets process requirements and product specifications</li> <li>c. Ensure first piece or production run meets specifications</li> <li>d. Document set-p procedures to ensure repeatability</li> <li>e. Ensure setup meets ergonomic and other relevant health, safety and environmental standards</li> <li>f. Ensure set up meets equipment specifications</li> </ul> </li> <li>4. Set team production goals               <ul style="list-style-type: none"> <li>a. Set team goals that are specific, measurable, achievable, relevant and time bound</li> <li>b. Align team goals with customer and business needs</li> <li>c. Ensure team goals focus the team in order to meet team objectives</li> <li>d. Document team goals and communicate them to all parties</li> </ul> </li> <li>5. Make job assignments               <ul style="list-style-type: none"> <li>a. Ensure job assignments match skills with the production work to be done</li> <li>b. Ensure job assignments maximize the use of available skills</li> <li>c. Ensure business and customer needs are met</li> <li>d. Ensure workers are notified of job assignments effectively</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		<p>6. Coordinate work flow with team members and other work groups</p> <ul style="list-style-type: none"> <li>a. Meet production schedules</li> <li>b. Notify team members of schedule requirements in a timely manner</li> <li>c. Ensure production workflow runs efficiently</li> <li>d. Minimize downtime</li> <li>e. Work with others to facilitate effective workflow</li> <li>f. Participate in meetings and problem solving groups</li> </ul> <p>7. Communicate production and material requirements and product specifications</p> <ul style="list-style-type: none"> <li>a. Ensure communication reflects knowledge of production requirements, levels and product specifications</li> <li>b. Ensure communication reflects knowledge of material specifications and delivery issues and schedules</li> <li>c. Ensure communication demonstrates knowledge of customer and business production needs</li> <li>d. Initiate cross functionally in a timely and accurate manner to the correct parties</li> <li>e. Ensure communication is clear and relevant to production and products</li> <li>f. Track and document communications, as appropriate</li> </ul> <p>8. Perform, monitor and document the process to make the product</p> <ul style="list-style-type: none"> <li>a. Monitor process control data to ensure that the manufacturing process is meeting product specifications</li> <li>b. Ensure manufacturing process cycle time meets customer and business needs</li> <li>c. Ensure product meets customer specifications</li> <li>d. Label products appropriately for compliance or non-compliance</li> <li>e. Perform production operations in a manner that fully complies with all health, safety, and environmental policies and practices</li> </ul> <p>9. Document product and process compliance with customer requirements</p> <ul style="list-style-type: none"> <li>a. Complete documentation of compliance legibly</li> <li>b. Write documentation of compliance in the appropriate format and store correctly</li> <li>c. Forward documentation of compliance to the proper parties</li> <li>d. Complete documentation and obtain “sign off”</li> <li>e. Label products appropriately for compliance onion compliance</li> </ul>

Course Code	Course Name	Essential Standards
		<p>10. Prepare final product for shipping or distribution</p> <ol style="list-style-type: none"> <li>a. Ensure packaging materials meet packaging and shipping specifications, including proper labeling and safety requirements</li> <li>b. Ensure completed documentation of customer packaging and shipping instructions accompany product to next destination</li> <li>c. Communicate product availability to the proper parties in a timely manner</li> <li>d. Check product and all relevant information, such as quantity, destination and packaging instruction, against the work order</li> <li>e. Store or stage product for shipping</li> <li>f. Follow all laws and regulations with regard to labeling, packaging and transport</li> <li>g. Follow material handling procedures to prevent product damage</li> </ol> <p>1. Work Flow Planning and Control</p> <ol style="list-style-type: none"> <li>1. Describe principles of Lean Manufacturing and High Performance Work Organizations</li> <li>2. Make job assignments and coordinate workflow</li> <li>3. Ensure appropriate resources are available to meet customer specifications</li> <li>4. Ensure setup and operation procedures are available and up-to date</li> <li>5. Read and interpret a production schedule and manufacturing work order</li> <li>6. Explain production process, including flow and bottlenecks</li> <li>7. Describe lead time required for a production plan</li> <li>8. Read and interpret bills of materials and routing sheets</li> <li>9. Explain methods of productivity measurement and improvement</li> <li>10. Define principles and practice of Just in time (JIT) inventory control</li> </ol> <p>11. Perform a physical inventory</p> <p>2. Production equipment operations</p> <ol style="list-style-type: none"> <li>1. Start and operate production machines</li> <li>2. Perform emergency shutdown of production machines</li> <li>3. Recognize and address machine malfunctions</li> <li>4. Describe common types of mechanisms used in machines</li> <li>5. Describe ways in which force and torque are used in machine operations</li> <li>6. Explain impact of friction on machine operation and methods</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Explain use of cams</p> <p>8. Define ways in which machines use pulley and gear drives</p> <p>9. Describe which manufacturing processes are used to make and finish parts</p> <p>10. Use basic types of manual machine tools, such as drill press and cutoff saw</p> <p>11. Define basic machine tooling</p> <p>12. Describe basic casting, molding and stamping processes</p> <p>13. Describe basic direct digital and additive manufacturing</p> <p>14. Define and use injury prevention safety devices on machines</p> <p>3. Production Materials, Tools and Equipment</p> <p>1. Describe various materials used in production</p> <p>2. Explain machinery operation, set up and testing</p> <p>3. Read and interpret gauges (i.e., analog, digital and Vernier)</p> <p>4. Determine whether additional tools need to be purchased</p> <p>5. Describe lubricants and coolants to make the proper selection</p> <p>6. Set up, program and operate computerized control process</p> <p>7. Describe equipment capabilities to maximize productivity</p> <p>8. Make machine adjustments</p> <p>9. Order tools and materials</p> <p>Work Orders and Documentation</p> <p>1. Interpret work orders to meet customer needs</p> <p>2. Review order sheets to determine if on site adjustments are needed</p> <p>3. Use diagrams and technical drawings</p> <p>4. Interpret route sheets and operation sheets to set up and operate machine</p> <p>5. Complete compliance tag to indicate that the sub assembly meets the customer requirements</p> <p>6. Determine packing requirements based upon customer specifications</p> <p>7. Determine packing requirements based upon available packing materials</p> <p>8. Determine the safest method of shipping the product based upon available packing materials</p>

Course Code	Course Name	Essential Standards
		<p>5. Advanced Technologies</p> <ol style="list-style-type: none"> <li>1. Describe advanced technologies that are now in common use, such as Computer Numerically Controlled machines (CNC), Industrial Robotics, Programmable Logic Controllers (PLC), Lean Processes, Sensors and Lasers, Mobile Internet, and the Internet of Things</li> <li>2. Describe emerging technologies that could become commonly used in the next one to four years, such as Additive Manufacturing (3D Printing), Augmented Reality, Mechatronics, Nanotechnology and Next Generation Robotics</li> </ol> <p><b>MAINTENANCE AWARENESS</b></p> <ol style="list-style-type: none"> <li>1. Perform preventive maintenance and routine repair <ol style="list-style-type: none"> <li>a. Monitor preventive maintenance schedule</li> <li>b. Follow preventive maintenance schedule</li> <li>c. Document preventive maintenance in a timely manner</li> <li>d. Communicate repair needs to the correct parties using correct procedures and forms</li> <li>e. Check any necessary repair work through follow up</li> <li>f. Ensure necessary supplies are available to perform preventive maintenance</li> <li>g. Communicate preventive maintenance schedules, documentation, equipment needs and outstanding repairs from shift to shift, to team members, to managers and to others as required</li> <li>h. Follow all safety procedures when performing repairs</li> </ol> </li> <li>2. Monitor indicators to ensure correct operations <ol style="list-style-type: none"> <li>a. Compare current equipment performance to optimal equipment operations regularly</li> <li>b. Investigate abnormal equipment conditions</li> <li>c. Correct abnormal equipment conditions in a timely manner</li> <li>d. Monitor equipment to ensure that corrective action solved the problem</li> <li>e. Document equipment repair history</li> </ol> </li> <li>3. Perform all housekeeping to maintain production schedule <ol style="list-style-type: none"> <li>a. Store tools in proper locations and integrate a system for organizing spaces so work can be performed efficiently, effectively and safely (such as 5S or 6S)</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>b. Store materials in a safe manner</li> <li>c. Identify and promptly report unsafe conditions</li> <li>d. Take corrective action to address unsafe conditions</li> <li>e. Ensure workstation is clean and clear of safety hazards</li> <li>f. Pass scheduled housekeeping inspections</li> <li>g. Organize workstation to maximize efficiency</li> </ul> <p>4. Recognize potential maintenance issues with basic production systems, including knowledge of when to inform maintenance personnel about problems with:</p> <ul style="list-style-type: none"> <li>a. Electrical systems</li> <li>b. Pneumatic systems</li> <li>c. Hydraulic systems</li> <li>d. Machine automation systems</li> <li>e. Lubrication processes</li> <li>f. Bearings and couplings</li> <li>g. Belts and chain drives</li> <li>h. High vacuum systems</li> <li>i. Laser systems</li> </ul> <p><b>MAINTENANCE AWARENESS</b></p> <ul style="list-style-type: none"> <li>1. Overall Maintenance Process</li> <li>1. Explain principles of Total Productive Maintenance (TPM)</li> <li>2. Describe what equipment is to be maintained and monitored</li> <li>3. Troubleshoot to identify a problem with equipment</li> <li>4. Follow preventive maintenance schedules</li> <li>5. Define job specific guidelines or collective bargaining agreement that affect maintenance</li> <li>6. Recognize significant wear and tear on equipment components</li> <li>7. Follow procedures for logging repairs and work order requests</li> <li>8. Explain the most common causes of failure of equipment to diagnose problem quickly</li> </ul>

Course Code	Course Name	Essential Standards
		<p>9. Explain what equipment alarms mean  10. Make on-process adjustments during production</p> <p>2. Maintenance of Tools and Equipment  1. Describe materials management to know what is recyclable and what is not  2. Use appropriate maintenance tools to maintain machines  3. Use monitoring or diagnostic devices to find out when equipment is operating correctly</p> <p>3. Documentation of Maintenance  1. Ensure that equipment is producing a quality product using statistical methods charts  2. Explain which forms and procedures to use for correctly documenting needs  3. Repair equipment using diagrams, schematics, manuals and specifications  4. Document repairs, replacement parts, problems and corrective actions to maintain log to determine patterns of operation  5. Review maintenance log/checklist to ensure that recommended preventative procedures are followed</p> <p>4. Maintenance-related Safety  1. Verify machine safety through proper set-up  2. Explain safety procedures to prevent accidents  3. Know the certification/license requirements to operate specific equipment  4. Use and store hazardous materials and chemicals (e.g., compliance with SDS, EPA and DOT regulations)  5. Describe Lock out/Tag out policies and procedures  6. Visually inspect equipment to ensure safety compliance before operating  7. Identify and report unsafe work conditions  8. Define materials management to know what is recyclable and what is not</p> <p>5. Potential maintenance issues with basic production systems</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Define electrical systems reliability issues, including knowledge of when to inform maintenance personnel</li> <li>2. Define pneumatic systems reliability issues, including knowledge of when to inform maintenance personnel</li> <li>3. Define hydraulic systems reliability issues, including knowledge of when to inform maintenance personnel</li> <li>4. Define machine automation systems reliability issues, including knowledge of when to inform maintenance personnel</li>   <li>6. Proper lubrication procedures               <ol style="list-style-type: none"> <li>1. Take and analyze oil samples</li> <li>2. Use correct lubricants for various types of equipment</li> <li>3. Operate grease guns correctly for various types of lubrication</li> <li>4. Store and dispose of lubricants safely</li> <li>5. Monitor machine for coolant level and correct mixture</li> </ol> </li>   <li>7. Bearings and coupling reliability               <ol style="list-style-type: none"> <li>1. Explain proper functioning of mechanical power transmission equipment, including knowledge of when to inform maintenance personnel</li> <li>2. Describe proper functioning of bearings and shafts, including knowledge of when to inform maintenance personnel</li> <li>3. Explain proper functioning of couplings, including knowledge of when to inform maintenance personnel</li> </ol> </li>   <li>8. Belt and chain drive reliability               <ol style="list-style-type: none"> <li>1. Describe proper functioning of belt drive systems, including knowledge of when to inform maintenance personnel</li> <li>2. Explain proper functioning of roller chain drive systems, including knowledge of when to inform maintenance personnel</li> <li>3. Explain proper adjustment of chain sag, including knowledge of when to inform maintenance personnel</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
<b>Integrated Production Technologies</b>		
6222	Integrated Production Technologies 1 - Advanced Technology for Design and Production	To receive course standards for all SREB Advanced Career curriculum visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6223	Integrated Production Technologies 2 - Systems of Advanced Technology	To receive course standards for all SREB Advanced Career curriculum visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6224	Integrated Production Technologies 3 - Mechatronic Systems for Advanced Production	
6225	Integrated Production Technologies 4 - Design for the Production of Advanced Products	
<b>Machine Technology</b>		
6230	Machine Tool Technology 1	<p>A. Safety</p> <ol style="list-style-type: none"> <li>1. Review school safety policies and procedures.</li> <li>2. Review classroom safety rules and procedures.</li> <li>3. Review safety procedures for using equipment in the classroom.</li> <li>4. Identify major causes of work-related accidents in office environments.</li> <li>5. Demonstrate safety skills in an office/work environment.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>D. Personal Qualities and Employability Skills</p> <ol style="list-style-type: none"> <li>1. Demonstrate punctuality.</li> <li>2. Demonstrate self-representation.</li> <li>3. Demonstrate work ethic.</li> <li>4. Demonstrate respect.</li> <li>5. Demonstrate time management.</li> <li>6. Demonstrate integrity.</li> <li>7. Demonstrate leadership.</li> <li>8. Demonstrate teamwork and collaboration.</li> <li>9. Demonstrate conflict resolution.</li> <li>10. Demonstrate perseverance.</li> <li>11. Demonstrate commitment.</li> <li>12. Demonstrate a healthy view of competition.</li> <li>13. Demonstrate a global perspective.</li> <li>14. Demonstrate health and fitness.</li> <li>15. Demonstrate self-direction.</li> <li>16. Demonstrate lifelong learning.</li> </ol> <p>F. Job Process Planning and Management</p> <ol style="list-style-type: none"> <li>1. Develop a process for a part requiring milling, drilling, turning, or grinding.</li> <li>2. Fill out an operation sheet detailing the process plan and required speeds and feeds.</li> </ol> <p>G. Materials</p> <ol style="list-style-type: none"> <li>1. Define metallurgy and understand how metals are classified.</li> <li>2. Identify the different classification systems for metals, ISO standard, unified numbering system and color coding.</li> <li>3. Understand different techniques for machining diverse ferrous metals.</li> <li>4. Identify the different classifications of carbon steel.</li> <li>5. Identify the different types of carbon steels (e.g. hot-rolled, cold-rolled, alloy steels).</li> <li>6. Recognize the different characteristics of various types of metals (e.g. ferrous, nonferrous, High Temperature, and rare).</li> <li>7. Understand and identify the factors which determine machinability.</li> </ol> <p>H. Print Reading/Drawing</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Blueprint Basics               <ol style="list-style-type: none"> <li>a. Understand industrial language terms.</li> <li>b. Understand the use of blueprints.</li> <li>c. Understand the basics of how a blueprint is laid out.</li> </ol> </li> <li>2. Blueprint Standards               <ol style="list-style-type: none"> <li>a. Match ISO and ANSI with their definitions.</li> <li>b. Identify the symbols associated with ISO and ANSI standards.</li> <li>c. Identify the meaning of orthographic projection.</li> <li>d. Decipher the difference between 3rd and 1st angle projection.</li> <li>e. Identify where different standards are used throughout the world.</li> </ol> </li> <li>3. Drawing Views               <ol style="list-style-type: none"> <li>a. List the six principle views associated with orthographic projection.</li> <li>b. Decipher the difference between 3rd and 1st angle projection.</li> <li>c. Decipher the difference between one, two and three view drawings.</li> <li>e. Identify what a section view represents.</li> </ol> </li> <li>4. Drawing Types               <ol style="list-style-type: none"> <li>a. Identify section lines.</li> <li>b. Decipher the difference between engineering drawings and blueprints.</li> <li>c. Interpret detailed drawings.</li> <li>d. Identify shape and size descriptions of detailed drawings.</li> <li>e. Identify specifications of detailed drawings.</li> <li>f. Interpret assembly drawings.</li> <li>g. Identify assembly drawings.</li> </ol> </li> <li>5. Blueprint Layout               <ol style="list-style-type: none"> <li>a. Identify the 5 standard paper sizes for blueprints.</li> <li>b. Decipher the different sections of a blueprint.</li> <li>c. Understand the basic blueprint template.</li> <li>d. Identify and interpret the seven different components of a blueprint title block.</li> </ol> </li> <li>I. Quality Control and Inspection               <ol style="list-style-type: none"> <li>1. Develop an inspection plan and inspect simple parts using precision tools and techniques.</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<p>2. Prepare reports on the compliance of the parts.</p> <p>3. Precision Measurements</p> <p>a. Steel Rules</p> <ol style="list-style-type: none"> <li>1) Identify the types of measurements that can be measured accurately with steel rules.</li> <li>2) Understand the physical attributes of steel rules.</li> <li>3) Understand the different configurations of steel rules.</li> <li>4) Decipher between a fractional scale and a decimal scale.</li> <li>5) Identify what scale needs to be used based on the dimensional size on the part print.</li> <li>6) Understand how to properly position a steel rule on a part.</li> <li>7) Determine the measurement value using a fractional scale.</li> <li>8) Determine the measurement value using a decimal scale.</li> </ol> <p>b. Slide Calipers</p> <ol style="list-style-type: none"> <li>1) Decipher between a vernier, dial, and digital precision caliper.</li> <li>2) Identify the three different measurements that can be taken with precision calipers.</li> <li>3) Clean and calibrate precision calipers.</li> <li>4) Identify specifications that should be measured with a precision calipers.</li> <li>5) Identify the different components of precision calipers.</li> <li>6) Use, read and interpret an inch Vernier precision caliper.</li> <li>7) Use, read and interpret a metric Vernier precision caliper.</li> <li>8) Use, read and interpret a dial precision caliper.</li> <li>9) Use, read and interpret a digital precision caliper.</li> </ol> <p>c. Micrometers</p> <ol style="list-style-type: none"> <li>1) Identify different types of micrometers.</li> <li>2) Identify the different components of micrometers.</li> <li>3) Understand the mechanics of a micrometer.</li> <li>4) Properly handle and maintain micrometers.</li> <li>5) Properly test and calibrate micrometers.</li> <li>6) Use, read and interpret outside micrometers.</li> <li>7) Use, read and interpret depth micrometers.</li> </ol> <p>J. Job Execution</p> <ol style="list-style-type: none"> <li>1. Manual Operations: Bench work</li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>a. Using aluminum, hand drill and hand tap holes.</li> <li>b. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts.</li> <li>c. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.</li> <li>2. Manual Operations: Layout <ul style="list-style-type: none"> <li>a. Layout the location of hole centers and surfaces within an accuracy of +/- .015.</li> </ul> </li> <li>3. Contour Band Sawing <ul style="list-style-type: none"> <li>a. Set up and perform contour sawing to a layout.</li> <li>b. Choose and mount appropriate blades.</li> <li>c. Weld, break, and re-weld blades as necessary.</li> </ul> </li> <li>4. Drill Press <ul style="list-style-type: none"> <li>a. Setup and operate drill presses.</li> <li>b. Perform routine drill press operations.</li> </ul> </li> <li>5. Turning Operations: Between Centers Turning <ul style="list-style-type: none"> <li>a. Setup and carry out between centers turning operations for straight turning.</li> </ul> </li> <li>6. Turning Operations: Chucking <ul style="list-style-type: none"> <li>a. Setup and carry out chucking operations for turning.</li> </ul> </li> <li>7. Milling: Square Up a Block <ul style="list-style-type: none"> <li>a. Set up and perform squaring up the six surfaces of a block to within +/- .002 and .002 over 4.5" squareness.</li> </ul> </li> <li>8. Vertical Milling <ul style="list-style-type: none"> <li>a. Setup and operate vertical milling machines. Perform routine milling and location of hole centers within +/- .005".</li> </ul> </li> <li>K. General Housekeeping and Maintenance <ul style="list-style-type: none"> <li>1. Keep the duty station clean and safe for work.</li> <li>2. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.</li> </ul> </li> <li>L. Preventive Maintenance: Machine Tools <ul style="list-style-type: none"> <li>1. Inspect and assess the general condition of an assigned machine tool.</li> <li>2. Make routine adjustments as necessary and as authorized.</li> <li>3. Report to supervision problems that are beyond the scope of authority.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		4. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.
6231	Machine Tool Technology 2	<p>M. Tooling Maintenance</p> <ol style="list-style-type: none"> <li>1. Inspect and assess the condition of tooling.</li> <li>2. Refurbish tooling where appropriate.</li> <li>3. Refer tooling for repair or regrind where appropriate.</li> </ol> <p>N. Industrial Safety and Environmental Protection</p> <ol style="list-style-type: none"> <li>1. Machine Operations and Material Handling <ol style="list-style-type: none"> <li>a. Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and deadlines.</li> <li>b. Document safety activities as required.</li> </ol> </li> <li>2. Hazardous Materials Handling and Storage <ol style="list-style-type: none"> <li>a. Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines.</li> <li>b. Document safety activities as required.</li> </ol> </li> </ol> <p>O. Career Management and Employment Relations</p> <ol style="list-style-type: none"> <li>1. Analyze modern machine careers.</li> <li>2. Develop and explain a short-term career plan and resume.</li> </ol> <p>F. Job Process Planning and Management</p> <ol style="list-style-type: none"> <li>1. Write a detailed process plan that includes a quality plan for a part requiring milling, drilling, turning, or grinding.</li> <li>2. Produce an operation sheet detailing the process plan.</li> <li>3. Identify all critical dimensions and required speeds and feeds.</li> <li>4. Provide sketches as needed.</li> </ol> <p>G. Print Reading/Drawing (GD&amp;T)</p> <ol style="list-style-type: none"> <li>1. Fundamentals of Geometric Dimensioning <ol style="list-style-type: none"> <li>a. Verify the purpose of dimensions in a drawing.</li> <li>b. Match commonly used dimension symbols and terminologies with their purpose.</li> <li>c. Identify size dimensions.</li> <li>d. Identify diameter dimensions.</li> </ol> </li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>e. Identify radius dimensions.</li> <li>f. Identify angular dimensions.</li> <li>g. Identify datum dimensions.</li> <li>h. Identify location dimensions.</li> <li>i. Understand dimensioning standards for threaded fasteners.</li> <li>j. Calculate dimensions on a blueprint.</li> <li>k. Demonstrate how precision dimensions are expressed.</li> <li>l. Understand what the drawing scale means.</li> <li>2. Fundamentals of Geometric Tolerancing               <ul style="list-style-type: none"> <li>a. Verify different tolerancing methods used in GD&amp;T.</li> <li>b. Identify tolerances located on an engineering drawing.</li> <li>c. Identify different tolerance types.</li> <li>d. Verify the purpose of tolerances.</li> <li>e. Identify the symbols used when tolerancing.</li> <li>f. Identify the terms used when tolerancing.</li> <li>g. Identify and interpret the different tolerancing methods.</li> <li>h. Interpret clearance, interference, and transition fits.</li> </ul> </li> <li>H. Quality Control and Inspection               <p>Effective machine tool operators demonstrate effective skills for quality control and inspection as used in machine tool operations. They will use this knowledge as needed in their role. The following accountability criteria are considered essential for students in the Machine Tool Technology program of study.</p> <ul style="list-style-type: none"> <li>1. Develop an inspection plan and inspect simple parts using precision tools and techniques.</li> <li>2. Prepare reports on the compliance of the parts.</li> <li>3. Precision Measurement                   <ul style="list-style-type: none"> <li>a. Slide Calipers                       <ul style="list-style-type: none"> <li>1) Decipher between a vernier, dial, and digital precision caliper.</li> <li>2) Identify the three different measurements that can be taken with precision calipers.</li> <li>3) Clean and calibrate precision calipers.</li> <li>4) Identify specifications that should be measured with a precision calipers.</li> </ul> </li> </ul> </li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		<p>5) Identify the different components of precision calipers.  6) Use, read and interpret an inch Vernier precision caliper.  7) Use, read and interpret a metric Vernier precision caliper.  8) Use, read and interpret a dial precision caliper.  9) Use, read and interpret a digital precision caliper.</p> <p>b. Micrometers</p> <p>1) Identify different types of micrometers.  2) Identify the different components of micrometers.  3) Understand the mechanics of a micrometer.  4) Properly handle and maintain micrometers.  5) Properly test and calibrate micrometers.  6) Use, read and interpret outside micrometers.  7) Use, read and interpret depth micrometers.</p> <p>I. Job Execution</p> <p>1. Lay Out Bolt Circles, Angles, Points of Tangency, and Profiles of a Line  a. Set up and lay out bolt circles, locations of surfaces related by non-right angles, locations of points of tangency between arcs and lines, and profiles of a line which is non-arc based.</p> <p>2. Contour Band Sawing  a. Set up and perform contour sawing to a layout.  b. Choose and mount appropriate blades.  c. Weld, break, and re-weld blades as necessary.</p> <p>3. Turning: Between Centers Taper Turning  a. Set up and perform between centers turning for straight and tapered turning by offsetting the tailstock.</p> <p>4. Turning: Chucking, O.D. and I.D. Tapers Using a Taper Attachment  a. Set up and perform tapered boring and turning using a taper attachment.</p> <p>5. Vertical Mill: Precision Location of Holes  a. Set up and perform boring for location, size, and finish.</p> <p>6. Milling: Keyseats  a. Set up and perform milling keyseats on a shaft.</p>

Course Code	Course Name	Essential Standards
		<p>7. Surface Grinding, Horizontal Spindle, Reciprocating Table</p> <ol style="list-style-type: none"> <li>a. Setup and operate manual surface grinders with an 8” and smaller diameter wheel.</li> <li>b. Perform routine surface grinding, location of surfaces, and squaring of surfaces.</li> <li>c. Perform wheel dressing.</li> <li>d. Perform visual safety inspection.</li> <li>e. Mount and dress a grinding wheel in preparation for surface grinding.</li> <li>f. Ring test grinding wheel.</li> </ol> <p>8. CNC Programming and Operations</p> <ol style="list-style-type: none"> <li>a. Set up and operate a computerized-numerical-control (CNC) machine for lathe and mill operations.</li> <li>b. Develop a program using NC (G-code) for the manufacture of a simple part using the principles of Cartesian coordinates.</li> </ol>
6232	Machine Tool Technology 3	<p>J. General Housekeeping And Maintenance</p> <ol style="list-style-type: none"> <li>1. Keep the duty station clean and safe for work.</li> <li>2. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.</li> </ol> <p>K. Preventive Maintenance: Machine Tools</p> <ol style="list-style-type: none"> <li>1. Inspect and assess the general condition of an assigned machine tool.</li> <li>2. Make routine adjustments as necessary and as authorized.</li> <li>3. Report to supervision problems which are beyond the scope of authority.</li> <li>4. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.</li> </ol> <p>L. Tooling Maintenance</p> <ol style="list-style-type: none"> <li>1. Inspect and assess the condition of tooling.</li> <li>2. Refurbish tooling where appropriate.</li> <li>3. Refer tooling for repair or regrind where appropriate.</li> </ol> <p>M. Industrial Safety and Environmental Protection: Machine Operations and Material Handling</p> <ol style="list-style-type: none"> <li>1. Carry out assigned responsibilities while adhering to safe to safe practices in accordance with OSHA requirements and guidelines.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>2. Document safety activities as required.</p> <p>N. Hazardous Materials Handling and Storage</p> <p>1. Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines.</p> <p>2. Document safety activities as required.</p> <p>O. Career Management and Employment Relations</p> <p>1. Analyze modern machine careers.</p> <p>2. Develop and explain a short-term career plan and resume.</p> <p>F. Job Planning and Management: Job Process</p> <p>1. Write a detailed process plan that includes a quality plan for a part requiring milling, drilling, turning, or grinding.</p> <p>2. Produce an operation sheet detailing the process plan.</p> <p>3. Identify all critical dimensions and required speeds and feeds.</p> <p>4. Provide sketches as needed.</p>
6233	Machine Tool Technology 4	<p>G. Print Reading/Drawing (GD&amp;T)</p> <p>1. Fundamentals of Geometric Dimensioning.</p> <p>a. Verify the purpose of dimensions in a drawing.</p> <p>b. Match commonly used dimension symbols and terminologies with their purpose.</p> <p>c. Identify size dimensions.</p> <p>d. Identify diameter dimensions.</p> <p>e. Identify radius dimensions.</p> <p>f. Identify angular dimensions.</p> <p>g. Identify datum dimensions.</p> <p>h. Identify location dimensions.</p> <p>i. Understand dimensioning standards for threaded fasteners.</p> <p>j. Calculate dimensions on a blueprint.</p> <p>k. Demonstrate how precision dimensions are expressed.</p> <p>l. Understand what the drawing scale means.</p> <p>2. Fundamentals of Geometric Tolerancing.</p> <p>a. Verify different tolerancing methods used in GD&amp;T.</p> <p>b. Identify tolerances located on an engineering drawing.</p>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>c. Identify different tolerance types.</li> <li>d. Verify the purpose of tolerances.</li> <li>e. Identify the symbols used when tolerancing.</li> <li>f. Identify the terms used when tolerancing.</li> <li>g. Identify and interpret the different tolerancing methods.</li> <li>h. Interpret clearance, interference, and transition fits.</li> <li>b. Set up and operate a CNC Milling Machine.</li> <li>c. Set up and operate a CNC Lathe.</li> <li>J. General Housekeeping and Maintenance <ul style="list-style-type: none"> <li>1. Keep the duty station clean and safe for work.</li> <li>2. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.</li> </ul> </li> <li>K. Preventive Maintenance: Machine Tools <ul style="list-style-type: none"> <li>1. Inspect and assess the general condition of an assigned machine tool.</li> <li>2. Make routine adjustments as necessary and as authorized.</li> <li>3. Report to supervision problems which are beyond the scope of authority.</li> <li>4. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.</li> </ul> </li> <li>L. Tooling Maintenance <ul style="list-style-type: none"> <li>1. Inspect and assess the condition of tooling.</li> <li>2. Refurbish tooling where appropriate.</li> <li>3. Refer tooling for repair or regrind where appropriate.</li> </ul> </li> <li>M. Process Adjustment and Improvement For Process Adjustment-Single Part Production <ul style="list-style-type: none"> <li>1. Analyze the performance of a single-part production process.</li> <li>2. Formulate process adjustments or improvements where appropriate.</li> <li>3. Where appropriate, notify supervision of the proposed adjustment and/or improvement.</li> <li>4. Where authorized, carry out the strategies for process adjustment and/or improvement.</li> <li>5. Critique a process for improvement in quality and productivity.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
<b>Mechatronics Integrated Technologies</b>		
6210	Mechatronics Integrated Technologies 1 – Electrical Components/Industrial Safety	<p>Mechatronics consists of four distinct areas covering manufacturing systems. Students are required to become familiar with each area. Teachers should pre-test students using tests available from NC3, Precision Exams or NCCER. Posttest can also use NC3, Precision Exams or NCCER.</p> <p>AC-DC Circuits /Industrial Safety (Safety standard is re-enforced in each section.)</p> <ol style="list-style-type: none"> <li>1. Explain the idea of a safety culture and its importance to mechatronics.</li> <li>2. Identify causes of accidents and the impact of accident costs.</li> <li>3. Explain the role of OSHA in job-site safety.*</li> <li>4. Explain OSHA’s General Duty Clause and 1926 CFR Subpart C.</li> <li>5. Recognize hazard recognition and risk assessment techniques.</li> <li>6. Explain fall protection and ladder, stair, and scaffold procedures and requirements.</li> <li>7. Identify struck-by hazards.</li> <li>8. Demonstrate safe working procedures and requirements related to lock out-tag out procedures.</li> <li>9. Identify caught-in-between hazards.</li> <li>10. Demonstrate safe working procedures and requirements related to caught-in-between hazards.</li> <li>11. Demonstrate safe work procedures to use around electrical hazards.</li> <li>12. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>13. Explain the importance of hazard communications (HazCom) and Safety Data Sheets (SDSs).</li> <li>14. Identify other construction hazards on your job site, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires.</li> <li>15. Recognize what atoms are and how they are constructed.</li> <li>16. Identify ways in which voltage can be produced.</li> <li>17. Demonstrate the difference between conductors and insulators.</li> </ol>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>18. Define the units of measurement that are used to measure the properties of electricity.</li> <li>19. Explain how voltage, current, and resistance are related to each other.</li> <li>20. Calculate electrical quantities using Ohm's Law.</li> <li>21. Calculate the amount of power used by a circuit.</li> <li>22. Demonstrate understanding of capacitance and inductance in a DC circuit.</li> <li>23. Construct a basic series circuit.</li> <li>24. Construct a basic parallel circuit.</li> <li>25. Construct a series-parallel combination circuit.</li> <li>26. Calculate, using Kirchhoff's Voltage Law, the voltage drop and total current in series, parallel, and series-parallel circuits.</li> <li>27. Measure the total amount of resistance in a series circuit.</li> <li>28. Measure the total amount of resistance in a parallel circuit.</li> <li>29. Measure the total amount of resistance in a series-parallel circuit.</li> <li>30. Compare calculated and measured electrical properties.</li> </ul>
6211	Mechatronics Integrated Technologies 2 – Mechanical Components Electric Drives/Hand and Power Tool Operations	<ul style="list-style-type: none"> <li>1. Illustrate use of basic hand and power tools (see tools and equipment list).</li> <li>2. Use torque wrenches.</li> <li>3. Describe the basic procedures for taking care of hand and power tools.</li> <li>4. Use hand and power tools safely.</li> <li>5. Demonstrate how to maintain hand and power tools properly.</li> <li>6. Compare the use of threaded fasteners and non-threaded fasteners.</li> <li>7. Demonstrate applications for fasteners and anchors.</li> <li>8. Demonstrate use of precision measurement tools (English and metric).               <ul style="list-style-type: none"> <li>a. Use levels.</li> <li>b. Use feeler gauges.</li> <li>c. Use calipers.</li> <li>d. Use micrometers.</li> <li>e. Uses dial indicators.</li> <li>f. Use protractors.</li> <li>g. Use parallels and gauge blocks.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>h. Use precision straightedges.</li> <li>i. Use a standard ruler and a metric ruler to measure.</li> <li>9. Evaluate the metric system and how it is important in mechatronics.</li> <li>10. Use metric units of length, weight, volume, and temperature.</li> <li>11. Convert English/standard to metric.</li> <li>12. Demonstrate the ability to perform layout work to include the use of calipers, drills, height and depth gauges, and other measurement tools.</li> <li>13. Demonstrate ability to install trouble shoot program AC/DC Drives (Allen Bradley/Siemens or appropriate companies)</li> </ul>
6212	Mechatronics Integrated Technologies 3 – Electro Pneumatics and Hydraulics	<ul style="list-style-type: none"> <li>1. Demonstrate hydraulic system safety.</li> <li>2. Explain the principles of hydraulics and hydraulic fluids.</li> <li>3. Identify hydraulic components (supply elements, control valves, and actuators).</li> <li>4. Explain hydraulic systems (forces, speed, friction, flow, and pressure).</li> <li>5. Identify types of hydraulic pumps.</li> <li>6. Identify types of hydraulic motors.</li> <li>7. Demonstrate pneumatic safety.</li> <li>8. Calculate the physical characteristics and compressibility of gases (Pascal's law and Boyle's law).</li> <li>9. Describe the pneumatic transmission of energy.</li> <li>10. Identify types of compressors.</li> <li>11. Analyze the principles of compressor operation and compressed-air treatment.</li> <li>12. Construct pneumatic systems from components and symbols.</li> <li>13. Demonstrate the ability to read, construct, and interpret fluid power symbols as well as fluid power diagrams.</li> <li>14. Demonstrate correct installation and maintenance as well as preventive maintenance techniques for fluid power systems using service manuals.</li> <li>15. Troubleshoot and repair fluid power systems using service manuals and gauges."</li> </ul>

Course Code	Course Name	Essential Standards
6213	Mechatronics Integrated Technologies 4 - Digital Fundamentals and Programmable Controllers	<p>Advanced AC Circuits</p> <ol style="list-style-type: none"> <li>1. Calculate the peak and effective voltage or current values for an AC waveform.</li> <li>2. Calculate the phase relationship between two AC waveforms.</li> <li>3. Measure the voltage and current phase relationship in a resistive AC circuit.</li> <li>4. Describe the voltage and current transients that occur in an inductive circuit.</li> <li>5. Define inductive reactance.</li> <li>6. Describe the voltage and current transients that occur in a capacitive circuit.</li> <li>7. Define capacitive reactance.</li> <li>8. Construct circuits showing the relationship between voltage and current in the following types of AC circuits:               <ol style="list-style-type: none"> <li>a. RL circuit</li> <li>b. LC circuit</li> </ol> </li> <li>9. Describe the effect that resonant frequency has on impedance and current flow in a series or parallel resonant circuit.</li> <li>10. Describe how bandwidth is affected by resistance in a series or parallel resonant circuit.</li> <li>11. Describe the following terms as they relate to AC circuits:               <ol style="list-style-type: none"> <li>a) True power</li> <li>b) Reactive power</li> <li>c) Apparent power</li> <li>d) Power factor</li> </ol> </li> <li>12. Describe operation of a transformer.</li> </ol>
<b>Metal Fabrication</b>		
6260	Metal Fabrication 1	Currently no courses being taught.
6261	Metal Fabrication 2	
6262	Metal Fabrication 3	

Course Code	Course Name	Essential Standards
6263	Metal Fabrication 4	
Welding Technology		
6340	Welding Technology 1	<p>A. Student Organizations</p> <ol style="list-style-type: none"> <li>1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).</li> <li>2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.</li> <li>3. Explain the benefits and responsibilities of being a member of a CTSO.</li> <li>4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.</li> <li>5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.</li> </ol> <p>B. Technology Knowledge</p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.</li> <li>2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.</li> <li>3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.</li> <li>4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).</li> <li>5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.</li> <li>6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.</li> <li>7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.</li> </ol> <p>NCCER Contren Core Modules</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Identify the responsibilities and personal characteristics of a professional craftsperson.</li> <li>2. Describe the safe work requirements for elevated work.</li> <li>3. Identify and explain how to avoid struck-by and caught-in-between hazards.</li> <li>4. Explain the appropriate safety precautions around common job-site hazards.</li> <li>5. Demonstrate the use and care of appropriate personal protective equipment (PPE).</li> <li>6. Identify and describe other specific job-site safety hazards.</li> <li>7. Follow safe procedures for lifting heavy objects.</li> <li>8. Describe safe behavior on and around ladders and scaffolds.</li> <li>9. Explain the importance of the Hazard Communication Standard (HazCom) requirement and Safety Data Sheets (SDS)</li> <li>10. Describe fire prevention and firefighting techniques.</li> <li>11. Define safe work procedures around electrical hazards.</li> <li>12. Complete 10-hour OSHA course/assessment and receive card. (SDE Requirement)</li> <li>13. Complete Performance Tasks               <ul style="list-style-type: none"> <li>A: Welding Safety                   <ol style="list-style-type: none"> <li>1. Identify some common hazards in welding.</li> <li>2. Explain and identify proper personal protection used in welding.</li> <li>3. Demonstrate how to avoid welding fumes.</li> <li>4. Explain some of the causes of accidents.</li> <li>5. Identify and explain uses for material safety data sheets.</li> <li>6. Demonstrate safety techniques for storing and handling cylinders.</li> <li>7. Explain how to avoid electric shock when welding.</li> <li>8. Demonstrate proper material handling methods.</li> </ol> </li> </ul> </li> </ol>
6341	Welding Technology 2	B: Oxyfuel Cutting <ol style="list-style-type: none"> <li>1. Identify and explain the use of oxyfuel cutting equipment.</li> <li>2. Set up oxyfuel equipment.</li> <li>3. Light and adjust an oxyfuel torch.</li> <li>4. Shut down oxyfuel cutting equipment.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Disassemble oxyfuel equipment.</p> <p>6. Change empty cylinders.</p> <p>7. Perform oxyfuel cutting:</p> <ul style="list-style-type: none"> <li>• Straight line and square shapes</li> <li>• Piercing and slot cutting</li> <li>• Bevels</li> <li>• Washing</li> <li>• Gouging</li> </ul> <p>8. Operate a motorized, portable oxyfuel gas cutting machine.</p> <p>C: Base Metal Preparation</p> <ol style="list-style-type: none"> <li>1. Clean base metal for welding or cutting.</li> <li>2. Identify and explain joint design.</li> <li>3. Explain joint design considerations.</li> <li>4. Using a nibbler, cutter, or grinder, mechanically prepare the edge of a mild steel plate ¼” to ¾” thick at 22½° (or 30° depending on equipment available).</li> <li>5. Using a nibbler, cutter, or grinder, mechanically prepare the end of a pipe with a 30° or 37½° bevel (depending on equipment available) and a 3/32” land. Use 6”, 8”, or 10” Schedule 40 or Schedule 80 mild steel pipe.</li> <li>6. Select the proper joint design based on a welding procedure specification (WPS) or instructor direction.</li> </ol> <p>D: SMAW – Equipment and Setup</p> <ol style="list-style-type: none"> <li>1. Identify and explain shielded metal arc welding (SMAW) safety.</li> <li>2. Identify and explain welding electrical current.</li> <li>3. Identify and explain arc welding machines.</li> <li>4. Explain setting up arc welding equipment.</li> <li>5. Set up a machine for welding.</li> <li>6. Identify and explain tools for weld cleaning.</li> </ol> <p>E: SMAW – Electrodes and Selection</p> <ol style="list-style-type: none"> <li>1. Identify factors that affect electrode selection.</li> <li>2. Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.</li> </ol>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>3. Identify different types of filler metals.</li> <li>4. Explain the storage and control of filler metals.</li> <li>5. Explain filler metal traceability requirements and how to use applicable code requirements.</li> <li>6. Identify and select the proper electrode for an identified welding task.</li> </ol>
6342	Welding Technology 3	<p>F: SMAW – Beads and Fillet Welds</p> <ol style="list-style-type: none"> <li>1. Set up shielded metal arc welding (SMAW) equipment.</li> <li>2. Describe methods of striking an arc.</li> <li>3. Properly strike and extinguish an arc.</li> <li>4. Describe causes of arc blow and wander.</li> <li>5. Make stringer, weave, and overlapping beads.</li> <li>6. Make fillet welds in the: <ul style="list-style-type: none"> <li>• Horizontal (2F) position</li> <li>• Vertical (3F) position</li> <li>• Overhead (4F) position</li> </ul> </li> </ol> <p>G: SMAW – Groove Welds with Backing</p> <ol style="list-style-type: none"> <li>1. Identify and explain groove welds.</li> <li>2. Identify and explain groove welds with backing.</li> <li>3. Set up shielded metal arc welding (SMAW) equipment for making V-groove welds.</li> <li>4. Perform SMAW for V-groove welds with backing in the: <ul style="list-style-type: none"> <li>• Flat (1G) position</li> <li>• Horizontal (2G) position</li> <li>• Vertical (3G) position</li> <li>• Overhead (4G) position</li> </ul> </li> </ol> <p>H: Joint Fit-Up and Alignment</p> <ol style="list-style-type: none"> <li>1. Identify and explain job code specifications.</li> <li>2. Use fit-up gauges and measuring devices to check joint fit-up.</li> <li>3. Identify and explain distortion and how it is controlled.</li> <li>4. Fit up joint using plate and pipe fit-up tools.</li> <li>5. Check for joint misalignment and poor fit-up before and after welding.</li> </ol>

Course Code	Course Name	Essential Standards
		<p>I: Welding Symbols</p> <ol style="list-style-type: none"> <li>1. Identify and explain the various parts of a welding symbol.</li> <li>2. Identify and explain fillet and groove weld symbols.</li> <li>3. Read welding symbols on drawings, specifications, and welding procedure specifications.</li> <li>4. Interpret welding symbols from a print.</li> <li>5. Draw welding symbols based on the observation of actual welds.</li> </ol>
6343	Welding Technology 4	<p>J: Reading Welding Detail Drawings</p> <ol style="list-style-type: none"> <li>1. Identify and explain a welding detail drawing.</li> <li>2. Identify and explain lines, material fills, and sections.</li> <li>3. Identify and explain object views.</li> <li>4. Identify and explain dimensioning.</li> <li>5. Identify and explain notes and bill of materials.</li> <li>6. Interpret basic elements of a welding detail drawing.</li> <li>7. Develop basic welding drawings.</li> </ol> <p>K: Plasma ARC Cutting (PAC)</p> <ol style="list-style-type: none"> <li>1. Identify and understand plasma arc cutting processes.</li> <li>2. Identify plasma arc cutting equipment.</li> <li>3. Prepare and set up plasma arc cutting equipment.</li> <li>4. Use plasma arc cutting equipment to make various types of cuts.</li> <li>5. Properly store equipment and clean the work area after use.</li> </ol> <p>L: GMAW and FCAW – Equipment And Filler Metals</p> <ol style="list-style-type: none"> <li>1. Explain gas metal arc welding (GMAW) and flux cored arc welding (FCAW) safety.</li> <li>2. Explain the characteristics of welding current and power sources.</li> <li>3. Identify and explain the use of GMAW and FCAW equipment: <ul style="list-style-type: none"> <li>• Spray transfer</li> <li>• Globular</li> <li>• Short circuiting</li> </ul> </li> <li>4. Identify and explain the use of GMAW and FCAW shielding gases and filler metals.</li> <li>5. Set up GMAW and FCAW equipment and identify tools for weld cleaning</li> </ol>

Course Code	Course Name	Essential Standards
		<p>M: GMAW AND FCAW – PLATE</p> <ol style="list-style-type: none"> <li>1. Perform GMAW multiple-pass fillet welds on plate, using solid or composite wire and shielding gas in multiple positions.</li> <li>2. Perform GMAW multiple-pass open-root V-groove welds on plate, using solid or composite wire and shielding gas, in multiple positions.</li> <li>3. Perform GMAW spray fillet and open-root V-groove welds on plate, using solid or composite wire and shielding gas, in flat and horizontal positions.</li> <li>4. Perform FCAW multiple-pass fillet welds on plate in multiple positions using flux cored wire and, if required, shielding gas.</li> <li>5. Perform FCAW multiple-pass open-root V-groove welds on plate in multiple positions using flux cored wire and, if required, shielding gas.</li> </ol>

## Marketing Cluster

Course Code	Course Name	Essential Standards
5470	Advertising	F. Marketing Fundamentals Review G. Development H. Forms of Media J. Creative Concepting L. Promotional Activities M. Career Development
5422	Digital Media Marketing	F. Career Development G. Marketing Fundamentals Review H. Advertising I. Digital Media Marketing J. The Creative Concept K. Budgetary Considerations L. Forms of Media M. Advertising Campaign
5410	Fashion Marketing	F. Marketing Cluster G. Fashion Industry Overview H. Nature of Fashion I. Product Technology J. Selling
5421	Marketing	F. Marketing Fundamentals G. Economics H. Price Planning and Strategies I. Promotion N. Marketing Plan O. Professional Development

Course Code	Course Name	Essential Standards
5431	Marketing Management	<ul style="list-style-type: none"> <li>F. Professional Development</li> <li>G. Organizational Skills</li> <li>H. Information Management</li> <li>I. Promotion</li> <li>J. Marketing Strategy Development</li> <li>K. Product and Service Marketing</li> <li>N. Marketing Budgets</li> <li>O. Decision Making and problem Solving in Marketing</li> <li>P. Investigation of the Product/Service Life Cycle</li> <li>Q. Products and Services Pricing</li> </ul>
5423	Marketing Analytics	<ul style="list-style-type: none"> <li>F. Principles of Market Research</li> <li>G. Marketing Research Process, Research Design</li> <li>I. Primary and Secondary Data</li> <li>J. Identifying Demographic Information</li> <li>K. Constructing Sample Designs</li> <li>L. Survey Techniques and Research Instruments</li> </ul>
5430	Merchandising	<ul style="list-style-type: none"> <li>F. Marketing Cluster</li> <li>G. Merchandising Fundamentals</li> <li>H. Product/Service Planning</li> <li>I. Buying</li> <li>J. Merchandise Pricing</li> <li>K. Licensing</li> <li>L. Inventory Control</li> </ul>
5471	Professional Sales	<ul style="list-style-type: none"> <li>D. Approach</li> <li>E. Determining Needs (Planning)</li> <li>F. Demonstration</li> <li>G. Answering Question (Overcoming Objections)</li> <li>H. Closing</li> </ul>

Course Code	Course Name	Essential Standards
		I. Suggestion Selling J. Service After the Sale (CRM-Customer Relationship Management) K. Professional Development L. Compensation M. Accountability
5034	Social Media Marketing	F. Social Media in the Business World G. Social Media Tools H. Social Media Applications in Marketing I. Social Media Monitoring J. Careers in Social Media
5426	Sports and Entertainment Management	F. Components of the Marketing Education Program G. Managerial Basics H. Management Functions I. Amateur and Recreation Sports J. College Sports K. Professional Sports L. Entertainment Industry M. Financial and Economic Concepts
5425	Sports and Entertainment Marketing	F. Marketing Fundamentals G. Introduction to Sports and Entertainment Industries H. Marketing Information and Product Services I. Pricing and Distribution J. Marketing and Promotion K. Selling L. Marketing Plan M. Business Ethics and Law N. Professional Development

## Science, Technology, Engineering and Mathematics Cluster

Course Code	Course Name	Essential Standards
6040	Industrial Technology 1 Exploratory	<p>Unit C. Design</p> <ol style="list-style-type: none"> <li>1. Develop an understanding of the attributes of design.</li> <li>2. Develop an understanding of engineering design.</li> </ol> <p>Unit D. Abilities For A Technological World</p> <ol style="list-style-type: none"> <li>1. Develop the abilities to apply the design process.</li> <li>2. Develop the abilities to use and maintain technological products and systems</li> </ol> <p>Unit E. The Designed World</p> <ol style="list-style-type: none"> <li>1. Develop an understanding of and be able to select and use medical technologies.</li> <li>2. Develop an understanding of and be able to select and use agricultural and related biotechnologies.</li> <li>3. Develop an understanding of and be able to select and use energy and power technologies.</li> </ol>
6041	Industrial Technology Education 2	<ol style="list-style-type: none"> <li>3. Develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.</li> </ol> <p>Unit D. Abilities For a Technological World</p> <ol style="list-style-type: none"> <li>3. Develop the abilities to assess the impact of products and systems.</li> </ol> <p>Unit E. The Designed World</p> <ol style="list-style-type: none"> <li>4. Develop an understanding of and be able to select and use information and communication technologies.</li> <li>5. Develop an understanding of and be able to select and use transportation technologies.</li> <li>6. Develop an understanding of and be able to select and use manufacturing technologies.</li> <li>7. Develop an understanding of and be able to select and use construction technologies.</li> </ol>

<b>Food Science</b>		
5757	Food Science 1	<p>B1. Explain how changes in society have impacted food science and related careers.</p> <p>C1. Explain safe and sanitary measures used to test food products in a laboratory setting.</p> <p>D1. Explain the scientific method, including the processes and skills of scientific inquiry, to develop understanding of science content.</p> <p>E1. Explore the basic chemistry of food science.</p>
5758	Food Science 2	<p>B1. Recommend professional practices that lead to success in food science.</p> <p>C1. Explain safe and sanitary measures used to test food products in a laboratory setting.</p> <p>D1. Implement the scientific method, including the processes and skills of scientific inquiry, to develop understanding of science content.</p> <p>E1. Identify chemistry concepts in food preparation.</p> <p>F1. Determine how the elements are affected by chemical reactions.</p> <p>G1. Evaluate the function of micro components in food preparation and preservation.</p>
<b>Core Engineering</b>		
6370	Core Engineering 1	<p>*Throughout the curriculum: History of Engineering, Impact on Society</p> <p><b>UNIT A: DESIGN PROCESS</b></p> <ol style="list-style-type: none"> <li>1. Identify and apply a design process.</li> <li>2. Perform structural and functional analysis.</li> <li>3. Apply effective leadership and teamwork methodologies.</li> </ol> <p><b>UNIT B: PROBLEM-SOLVING</b></p> <ol style="list-style-type: none"> <li>1. Utilize problem-solving methods to solve real-world problems.</li> <li>2. Evaluate design solutions based on implications to society and the environment.</li> </ol> <p><b>UNIT C: ENGINEERING COMMUNICATION</b></p> <ol style="list-style-type: none"> <li>1. Employ standard engineering documentation protocol such as engineering notebooks and/or portfolios.</li> <li>2. Generate technical reports utilizing APA format.</li> <li>3. Create presentations to communicate design solutions.</li> </ol> <p><b>UNIT D: SKETCHING AND DRAWING</b></p> <ol style="list-style-type: none"> <li>1. Prepare technical drawings using ANSI and/or ISO standards.</li> </ol>

		<p>2. Apply scale, dimensioning, and tolerance standards to drawings.</p> <p><b>UNIT E: ENGINEERING DISCIPLINES</b></p> <p>1. Explore and differentiate among the various engineering disciplines.</p> <p><b>UNIT F: DESIGN AND MODELING</b></p> <p>2. Create and edit an engineering model using 3D CAD software</p> <p>3. Produce acceptable deliverables.</p> <p>4. Extract and interpret physical properties of a solid model from CAD software.</p> <p><b>UNIT G: ENGINEERING COMPUTATIONS</b></p> <p>1. Demonstrate proper use of engineering measurement tools with precision.</p> <p>2. Convert between US Customary and SI units.</p> <p>3. Calculate physical properties of geometric shapes and solids.</p> <p>4. Calculate central tendencies and descriptive statistics including standard deviation and empirical rule.</p>
6371	Core Engineering 2	<p>Design, build, program, and test an automated system to handle materials. Engineering Documentation, Ethics, Design Analysis, throughout the curriculum.</p> <p><b>UNIT A: SIMPLE MACHINES AND MECHANISMS</b></p> <p>1. Identify the six types of simple machines and their parts.</p> <p>2. Calculate work and power.</p> <p>3. Calculate ideal mechanical advantage.</p> <p>4. Calculate actual mechanical advantage.</p> <p>5. Calculate mechanical system efficiency.</p> <p>6. Calculate variables of gear-driven systems such as angular velocity, torque, gear ratios, number of teeth, and direction of rotation.</p> <p>7. Calculate variables of belts-driven systems such as angular velocity, diameters, and torque.</p> <p><b>UNIT B: FORCES</b> Statics and Structural Analysis</p> <p>1. Identify and apply Newton's Three Laws of Motion.</p> <p>2. Calculate the centroid of simple shape.</p> <p>3. Calculate the centroid of a complex shape.</p> <p>4. Calculate the moment of inertia for a rectangular shape.</p> <p>5. Calculate beam deflection.</p>

		<p>6. Calculate modulus of elasticity.</p> <p>7. Understand vector notation.</p> <p>8. Analyze a vector and calculate component forces.</p> <p>9. Create a free body diagram for a system.</p> <p>10. Calculate moments about an axis.</p> <p>11. Calculate reaction forces for a structure.</p> <p>*throughout the curriculum</p> <p>12. Calculate tensile and compressive forces in a truss.</p> <p>13. Calculate strength to weight ratio.</p> <p>Fluid Power</p> <p>1. Identify the types and applications of fluid power systems.</p> <p>2. Calculate work and power.</p> <p>3. Compare pneumatic versus hydraulic systems.</p> <p>4. Calculate properties of a fluid power system using Pascal's Law.</p> <p>5. Calculate temperature, pressure, and volume using ideal gas laws.</p> <p>UNIT C: ENERGY AND POWER</p> <p>Electricity/Electronics</p> <p>1. Identify electrical hazards.</p> <p>2. Understand and demonstrate safety procedures.</p> <p>3. Calculate work and power.</p> <p>4. Explain and classify a material as either a conductor or insulator.</p> <p>5. Identify and measure electrical components in a circuit.</p> <p>6. Distinguish between conventional current and electron current flow.</p> <p>7. Distinguish between AC and DC current.</p> <p>8. Distinguish between analog and digital.</p> <p>9. Define Ohms law.</p> <p>10. Define Kirchhoff's current and voltage laws.</p> <p>11. Explain the relationship between voltage, current, and resistance.</p> <p>12. Calculate electrical properties using Ohm's law and Kirchhoff's laws.</p> <p>13. Identify, create, and analyze series, parallel and simple combination circuits.</p> <p>Thermodynamics</p> <p>1. Identify and explain the three methods of heat transfer (conduction, convection, and radiation).</p>
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		<p>2. Calculate rate and amount of heat transfer in thermodynamic systems.</p> <p>3. Analyze a structure for heat transfer using R-values.</p> <p>4. Identify and explain the laws of thermodynamics.</p> <p><b>UNIT D: MACHINE DESIGN AND CONTROL SYSTEMS</b></p> <p>1. Differentiate between open and closed loop systems.</p> <p>2. Identify and select appropriate inputs, outputs, and sensors.</p> <p>3. Program a robot/machine to perform a task.</p> <p><b>UNIT E: MATERIALS ANALYSIS</b></p> <p>1. Demonstrate knowledge of classes of materials and their properties.</p> <p>2. Justify material choices for a product in terms of availability, cost, manufacturing methods, application, and environment.</p> <p>3. Identify and choose appropriate processes for manufacturing, such as casting, milling, turning, forming, and grinding (additive versus subtractive processes).</p> <p>4. Explain how raw materials are transformed into finished products including the product life cycle (disposal, recycling, and environmental impacts).</p> <p><b>Destructive Testing</b></p> <p>1. Calculate stress and strain.</p> <p>2. Evaluate properties of a metal from a stress/strain curve.</p> <p>3. Perform a destructive test on a metal (physically or virtually).</p> <p><b>Reverse Engineering</b></p> <p>1. Identify mechanical fasteners and corresponding tools.</p> <p>2. Identify inputs, outputs, and possible processes of the system.</p> <p>3. Perform a tear-down, cataloguing, and identification of a manufactured product and its parts.</p> <p><b>UNIT F: KINEMATICS</b></p> <p>1. Identify forces acting upon a projectile.</p> <p>2. Calculate firing angle, initial velocity, and range.</p> <p>3. Understand concepts of position, velocity, and acceleration.</p> <p>*Design, build, test, and evaluate a ballistic device.</p>
6375	Core Engineering 3	Engineering Specialization 1 Prerequisites: Core Engineering 1 and 2

		<ol style="list-style-type: none"> <li>1. Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.</li> <li>2. Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</li> <li>3. Apply engineering skills in a project that requires project management, process control and quality assurance.</li> <li>4. Use technology to acquire, manipulate, analyze and report data from project-based activities.</li> <li>5. Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.</li> <li>6. Understand the nature and scope of the STEM Cluster, specifically the role of engineering in society.</li> <li>7. Demonstrate an understanding of the breadth of career opportunities in engineering and avenues to reach them.</li> <li>8. Demonstrate technical skills needed in a chosen engineering field.</li> </ol>
6376	Core Engineering 4	<ol style="list-style-type: none"> <li>1. Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.</li> <li>2. Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</li> <li>3. Use STEM concepts and processes to solve engineering problems involving design and/or production.</li> <li>4. Collect and analyze results from project-based activities and communicate with various stakeholders.</li> <li>5. Apply processes and concepts for the use of technological tools in engineering.</li> <li>6. Apply the elements of a design process.</li> <li>7. Apply the knowledge learned in STEM to solve engineering problems.</li> <li>8. Apply the knowledge learned in the study of STEM to provide solutions to human and societal problems in an ethical and legal manner.</li> </ol>

Pre-Engineering (Project Lead the Way)			
6144	Engineering Essentials	To receive course standards for all Pathway To Engineering courses visit the PLTW web site - <a href="http://www.pltw.org">www.pltw.org</a>	
6051	Introduction to Engineering		
6050	Principles of Engineering		
6052	Digital Electronics		
6053	Computer Integrated Manufacturing		
6054	Engineering Design and Development		
6056	Aerospace Engineering		
6058	Civil Engineering and Architecture		To receive course standards for all Pathway To Engineering courses visit the PLTW web site - <a href="http://www.pltw.org">www.pltw.org</a>
6374	Environmental Sustainability		
6377	Computer Science Principles		

<b>Aerospace Engineering Technology</b>		
6386	Fundamentals of Aerospace Technology	To receive course standards for all SREB Advanced Career curriculums visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6387	Advanced Aerospace Technology	
6388	Aeronautics Engineering Applications	
6389	Astronautics Engineering Applications	
<b>Clean Energy</b>		
6380	Clean Energy Systems	To receive course standards for all SREB Advanced Career curriculums visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6381	Clean Energy Applications	
6382	Clean Energy Strategies	

6383	Clean Energy Innovations	
<b>Innovations in Science and Technology</b>		
6140	The Nature of Science and Technology	To receive course standards for all SREB Advanced Career curriculums visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6141	Core Applications of Science and Technology	
6142	Impacts of Science and Technology	
6143	Creativity and Innovations	

## Transportation, Distribution, and Logistics Cluster

Course Code	Course Name	Essential Standards
<b>Auto Collision Repair Technology</b>		
6020	Auto Collision Repair Technology 1	<p>F. Vehicle Construction and Collision Energy Management</p> <ol style="list-style-type: none"> <li>1. Describe various types of vehicle construction, i.e., space frame, body-over-frame, and uni-body.</li> <li>2. Identify structural parts and cosmetic parts.</li> <li>3. Demonstrate knowledge of collision energy management principles</li> </ol> <p>Section I: Non-Structural Analysis and Damage Repair (B3)</p> <p>Unit A. Preparation</p> <ol style="list-style-type: none"> <li>1. Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan. HP-I,DAM01 v2.4 modules 1, 2   DAM01 v2.5 modules 1, 2, 3, 4, 5   DAM10 Module 1,  EXT01 module 1</li> <li>2. Inspect, remove, label, store, and reinstall exterior trim and moldings. HP-I,DAM04 v2.1 module 4   DAM04 module 3   DAM10 Module 1   TRM01 modules 3, 6, 7</li> <li>3. Inspect, remove, label, store, and reinstall interior trim and components. HP-I,ADH01 v1.3 modules 1, 2, 3   DAM02 v2.1 modules 1, 2, 3   DAM02 v2.2 module 2   EXT01 modules 1, 2, 3 4   EXT02 modules 1, 2, 3, 4, 5</li> </ol> <p>Unit B. Outer Body Panel Repairs, Replacements, and Adjustments</p> <ol style="list-style-type: none"> <li>1. Determine the extent of direct and indirect/hidden damage and direction of impact; develop and document a repair plan. HP-I, DAM02 v2.1 modules 1, 3   DAM02 v2.2 module 2   DAM12 Module 1   EDS01 module 2  FCR v2.1 modules 2, 3   STS01 modules 1, 2</li> <li>2. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies. HP-G, ADH01 v1.3 modules 1, 2, 3   DAM02 v2.1 modules 1, 2, 3   DAM02 v2.2 module 2   EXT01 modules 1, 2, 3, 4   EXT02 modules 1, 2, 3, 4, 5</li> <li>3. Determine the extent of damage to aluminum body panels; repair or replace HP-G, DAM05 module 2   PRA01 modules 1, 2, 3, 4, 5   STA01 modules 2, 3</li> </ol>

Course Code	Course Name	Essential Standards
		<p>4. Inspect, remove, replace, and align hood, hood hinges, and hood latch. HP-I, DAM02 v2.1 module 3   DAM02 v2.2 module 2   EXT01 module 2</p> <p>Unit C. Metal Finishing and Body Filling</p> <p>1. Remove paint from the damaged area of a body panel. HP-I, EDS01 module 3   STS01 module 2</p> <p>2. Locate and repair surface irregularities on a damaged body panel. HP-I, DAM02 v2.1 module 3   DAM02 v2.2 module 2   EDS01 modules 2, 3, 4   FCR v2.1 module 2   FCR01 v2.2 module 3   STS01 module 1, 2</p>
6021	Auto Collision Repair Technology 2	<p>Section I: Non-Structural Analysis And Damage Repair (B3)</p> <p>Unit A. Preparation</p> <p>4. Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair. HP-I,DAM02 v2.1 module 3   DAM02 v2.2 module 2   EXT01 module 2</p> <p>5. Inspect, remove, label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair. HP-G,DAM03 v2.2 modules 1, 2, 3, 4, 5, 6   DAM03 v2.4 modules 1,7   DAM04 modules 1, 2, 3  DAM06 module 2 EXT01 module 3</p> <p>Unit B. Outer Body Panel Repairs, Replacements, and Adjustments</p> <p>5. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch. HP-I, DAM04 module 3   EXT01 module 4</p> <p>6. Inspect, remove, replace, and align doors, latches, hinges, and related hardware. HP-I, DAM04 modules 2, 3   EXT01 modules 3, 4   EXT02 module 2</p> <p>7. Inspect, remove, replace and align tailgates, hatches, lift gates and sliding doors. HP-G, DAM04 modules 2, 3   EXT01 modules 3, 4   EXT02 module 2</p> <p>Unit C. Metal Finishing and Body Filling</p> <p>3. Demonstrate hammer and dolly techniques. HP-I, EDS01 module 2   STS01 module 2 4.</p> <p>Heat shrink stretched panel areas to proper contour. HP-I, EDS01 module 2   STS01 module 2</p>

Course Code	Course Name	Essential Standards
		<p>5. Cold shrink stretched panel areas to proper contour. HP-I, EDS01 module 2   STS01 module 2</p> <p>4. Heat shrink stretched panel areas to proper contour. HP-I, EDS01 module 2   STS01 module 2</p> <p>5. Cold shrink stretched panel areas to proper contour. HP-I, EDS01 module 2   STS01 module 2</p> <p>5. Cold shrink stretched panel areas to proper contour. HP-I, EDS01 module 2   STS01 module 2</p>
6022	Auto Collision Repair Technology 3	<p>Unit A. Preparation</p> <p>6. Protect panels, glass, interior parts, and other vehicles adjacent to the repair area. HP-I,EXT01 module 1   EXT02 modules 1, 2, 3, 4, 5</p> <p>7. Soap and water wash entire vehicle; complete pre-repair inspection checklist. HP-I, EDS02 module 3   REF02 module 1   REF04 module 1</p> <p>8. Prepare damaged area using water-based and solvent-based cleaners. HP-I,EDS02 module 3   REF02 module 1   REF04 module 1</p> <p>9. Remove corrosion protection, under coatings, sealers, and other protective coatings as necessary to perform repairs. HP-I, DAM02 v2.1 module 2   DAM02 v2.2 module 1   EXT01 modules 1, 2, 3, 4   EXT02 modules 1, 2, 3, 4, 5</p> <p>10. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair. HP-I DAM02 v2.1 module 2   DAM02 v2.2 module 1   EXT01 modules 1, 2, 3, 4   EXT02 modules 1, 2, 3, 4, 5</p> <p>Unit B. Outer Body Panel Repairs, Replacements, and Adjustments</p> <p>8. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware. HP-I, DAM02 module 2   EXT01 module 2   EXT02 module 5</p> <p>9. Inspect, remove, replace and align fenders, and related panels. HP-I, DAM02 v2.1 module 3   DAM02 v2.2 module 2   EXT01 module 2   EXT02 module 5</p> <p>10. Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments. HP-I, EDS01 modules 2, 3   STS01 module 2</p>

Course Code	Course Name	Essential Standards
		<p>11. Weld damaged or torn steel body panels; repair broken welds. HP-G, EDS02 module 3</p> <p>12. Restore corrosion protection. HP-I, CPS01 modules 3, 4</p> <p>13. Replace door skins. HP-G, ADH01 v1.2 module 1   ADH01 v1.3 modules 1, 2, 3   EXT02 module 2</p> <p>14. Restore sound deadeners and foam materials. HP-G, FOM01 modules 1, 2, 3, 4</p> <p>15. Perform panel bonding and weld bonding. HP-G, ADH01 v1.2 module 1 ADH01 modules 1, 2, 3</p> <p>16. Diagnose and repair water leaks, dust leaks, and wind noise. HP-G, WNW01 modules 1, 2, 3</p> <p>17. Identify one-time use fasteners. HP-G, TRM01 module 1</p> <p>Unit C. Metal Finishing and Body Filling</p> <p>6. Prepare and apply body filler. HP-I, EDS01 module 3   STS01 module 2 7. Identify different types of body fillers. HP-G, EDS01 module 3   STS01 module 3 8. Rough sand body filler to contour; finish sand. HP-I, EDS01 module 3   STS01 module 2 9. Determine the proper metal finishing techniques for aluminum. HP-G, DAM05 module 2   STA01 modules 2, 3 10. Determine proper application of body filler to aluminum. HP-G,PRA01 modules 3, 5  STA01 module2</p> <p>7. Identify different types of body fillers. HP-G, EDS01 module 3   STS01 module 3 8. Rough sand body filler to contour; finish sand. HP-I, EDS01 module 3   STS01 module 2 9. Determine the proper metal finishing techniques for aluminum. HP-G, DAM05 module 2   STA01 modules 2, 3 10. Determine proper application of body filler to aluminum. HP-G,PRA01 modules 3, 5  STA01 module2</p> <p>8. Rough sand body filler to contour; finish sand. HP-I, EDS01 module 3   STS01 module 2 9. Determine the proper metal finishing techniques for aluminum. HP-G, DAM05 module 2   STA01 modules 2, 3 10. Determine proper application of body filler to aluminum. HP-G,PRA01 modules 3, 5  STA01 module2</p> <p>9. Determine the proper metal finishing techniques for aluminum. HP-G, DAM05 module 2   STA01 modules 2, 3 10. Determine proper application of body filler to aluminum. HP-G,PRA01 modules 3, 5  STA01 module2</p>

Course Code	Course Name	Essential Standards
		<p>10. Determine proper application of body filler to aluminum. HP-G,PRA01 modules 3, 5  STA01 module2</p> <p>Unit D. Movable Glass and Hardware</p> <p>1. Inspect, adjust, repair or replace window regulators, run channels, glass power mechanisms, and related controls. HP-I, DAM04 module 2   GLA01 module 2   PWR01 module 5</p> <p>2. Inspect, adjust, repair, remove, reinstall or replace weather-stripping. HP-G, DAM04 module 2   TRM01 module 3</p> <p>3. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs. HP-G,DAM04 module 2   GLA01 module 4   PWR01 module 5</p> <p>4. Inspect, remove, reinstall, and align convertible top and related mechanisms. HP-G, DAM02 v2.1 module 3   DAM02 v2.2 module 2   EXT01 module 2</p> <p>5. Initialize electrical components as needed. HP-G, GLA01 Module 1, 4   PWR01 module 6</p>
6023	Auto Collision Repair Technology 4	<p>Unit E. Metal Welding and Cutting</p> <p>1. Identify weld able and non-weld able substrates used in vehicle construction. HP-I, EXT02 module 1   FCR01 module 1   SPS07 modules 1, 2   ITM01e   ITM02e</p> <p>2. Weld and cut high-strength steel and other steels. HP-I, EXT02 module 1   WCS01 v1.2 modules 1, 2, 3, 4   WCS01 v1.3 1, 2, 3, 4, 5 3. Weld and cut aluminum. WCA01 modules 1, 2</p> <p>4. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation. HP-I, EXT02 module 2 WCS01 module 1</p> <p>5. Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stick out, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded. HP-I, WCS01 module 1 6. Store, handle, and install high-pressure gas cylinders. HP-I, WCS01 module 1 7. Determine work clamp (ground) location and attach. HP-I, WCS01 v1.2 module 1</p>

Course Code	Course Name	Essential Standards
		<p>8. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. HP-I, WCS01 v1.2 module 1   WCS01 v1.3 modules 1, 2, 3, 4, 5</p> <p>9. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I, EXT02 modules 1, 2, 3, 4, 5   WCS01 v1.2 module 1   WCS01 module 1</p> <p>10. Protect computers and other electronic control modules during welding procedures. HP-I, WCS01 module 1</p> <p>11. Clean and prepare the metal to be welded, assure good metal fit-up, and apply weld-through primer if necessary, clamp or tack as required. HP-I, WCS01 v1.2 module 1</p> <p>12. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I, EXT02 modules 1, 2, 3, 4, 5</p> <p>13. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I, EXT02 modules 1, 2, 3, 4, 5</p> <p>14. Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc. HP-I, WCS01 v1.2 modules 2, 3, 4</p> <p>15. Perform visual and destructive tests on each weld type. HP-I, WCS01 v1.2 modules 2, 3, 4</p> <p>16. Identify the causes of various welding defects; make necessary adjustments HP-I, WCS01 v1.2 module 1</p> <p>17. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I, WCS01 module 1</p> <p>18. Identify cutting process for different substrates and locations; perform cutting operation. HP-I, SPS07 modules 1, 2   WCS05 module 4</p> <p>19. Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze, etc.). HP-G, FCR01 module 1   EXT02 module 1</p> <p><b>Unit F. Plastic and Adhesives</b></p> <p>4. Remove or repair damaged areas from rigid exterior composite panels. HP-G, EXT02 module 2   PLA02 module 3   PLA03 module 3</p> <p>5. Replace bonded rigid exterior composite body panels; straighten or align panel supports. HP-G, EXT02 module 2   PLA03 modules 3, 4</p>

Course Code	Course Name	Essential Standards
		<p>Section II: Painting and Refinishing (B2)</p> <p>Unit A. Safety Precautions</p> <p>5. Select and use a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation. HP-I, EDS02 module 1   REF01 module 2   WKR01 module 4</p> <p>6. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.). HP-I, EDS02 modules 1, 2, 3, 4, 5, 6, 7   REF02 module 2   REF03 modules 2, 4   WKR01 module 4</p> <p>Unit B. Surface Preparation</p> <p>1. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation. HP-I, DAM04 v.2.1 module 4   DAM04 v.2.2 module 3   TRM01 modules 3, 6, 7</p> <p>2. Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants. HP-I, EDS02 module 3   REF02 module 1   REF04 module 1</p> <p>3. Inspect and identify type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system. HP-G, DAM01 v.2.4 module 3   DAM01 v.2.5 module 4   EDS02 module 3   REF02 module 1</p> <p>4. Strip paint to bare substrate (paint removal). HP-I, EDS02 module 3   REF02 module 2</p> <p>5. Dry or wet sand areas to be refinished. HP-I, EDS02 module 3   REF02 module 4   REF03 module 2</p> <p>6. Featheredge areas to be refinished. HP-I, EDS02 module 3   REF02 module 4</p> <p>7. Apply suitable metal treatment or primer in accordance with total product systems. HP-I, CPS01 module 3   EDS02 module 4   REF02 module 4</p> <p>8. Mask and protect other areas that will not be refinished. HP-I, EDS02 module 3   REF02 module 2</p> <p>9. Mix primer, primer-surface or primer-sealer. HP-I, EDS02 module 4   REF01 module 5   REF02 module 4   REF03 module 4</p>

Course Code	Course Name	Essential Standards
		<p>10. Identify a complimentary color or shade of undercoat to improve coverage. HP-G, REF03 Module 2</p> <p>11. Apply primer onto surface of repaired area. HP-I, EDS02 module 4   REF02 module 4</p> <p>19. Scuff sand to remove nibs or imperfections from a sealer. HP-I, EDS02 module 4</p> <p>20. Apply stone chip resistant coating. HP-G, CPS01 module 4   EDS02 module 5   REF03 module 3</p> <p>21. Restore caulking and seam sealers to repaired areas. HP-G, CPS01 modules 3, 4   EDS02 modules 4, 5   REF02 module 5</p> <p>22. Prepare adjacent panels for blending. HP-I, EDS02 module 5   REF02 modules 4, 5</p> <p>23. Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures. HP-I, EDS02 module 5   REF02 module 4</p> <p>24. Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures. HP-I, EDS02 module 4   REF02 modules</p> <p><b>Unit C. Spray Gun and Related Equipment Operation</b></p> <p>1. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, airlines, air source, and spray environment). HP-I, EDS02 module 2   REF01 module 1</p> <p>2. Select spray gun setup (fluid needle, nozzle, and cap) for product being applied. HP-I, EDS02 module 2   REF01 module 1   REF02 module 3</p> <p>3. Test and adjust spray gun using fluid, air and pattern control valves. HP-I, EDS02 module 2   REF01 module 1   REF02 module 3</p> <p><b>Unit D. Paint Mixing, Matching, and Applying</b></p> <p>3. Apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied. HP-I, EDS02 module 2   REF02 module 3</p> <p>4. Apply selected product on test or let-down panel; check for color match. HP-I, REF03 module 2</p>

Course Code	Course Name	Essential Standards
		<p>5. Apply single stage topcoat. HP-G, EDS02 module 5   REF03 module 4</p> <p>6. Apply basecoat/clear coat for panel blending and panel refinishing. HP-I, EDS02 module 5   REF03 modules 3, 4</p> <p>7. Apply basecoat/clear coat for overall refinishing. HP-G, EDS02 module 5   REF03 module 4</p> <p>8. Remove nibs or imperfections from basecoat. HP-I, REF04 module 2</p> <p>9. Refinish rigid or semi-rigid plastic parts. HP-G,EDS02 module 5   REF03 modules 3, 4</p> <p>10. Refinish flexible plastic parts. HP-I, EDS02 module 5   REF03 modules 3, 4</p> <p>11. Apply multi-stage coats for panel blending and overall refinishing. HP-G, EDS02 module 5   REF03 module 4</p> <p>15. Identify alternative color formula to achieve a blend able match. HP-I, EDS02 module 5   REF03 module 2</p> <p>16. Identify the materials equipment, and preparation differences between solvent and waterborne technologies. HP-G, REF07</p> <p>Unit E. Paint Defects-Causes and Cures</p> <p>1. Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p> <p>2. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition. HP-I, EDS02 module 6   REF03 module 3</p> <p>3. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition. HP-I, EDS02 module 6   REF03 module 3</p> <p>4. Identify lifting; determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p> <p>5. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition. HP-I, EDS02 module 6</p> <p>6. Identify orange peel; determine the cause(s) and correct the condition. HP-I, EDS02 module 6   REF03 module 3   REF04 module 2</p> <p>7. Identify overspray; determine the cause(s) and correct the condition. HP-I, DAM01 v.2.4 module 3   DAM01 v.2.5 module 4   EDS02 module 6   REF04 module 2</p>

Course Code	Course Name	Essential Standards
		<p>8. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p> <p>9. Identify sags and runs in paint surface; determine the cause(s) and correct the condition. HP-I, EDS02 module 6 REF03 module 3 REF04 module 2</p> <p>10. Identify sanding marks or sand scratch swelling; determine the cause(s) and correct the condition. HP-I,DAM01 v.2.4 module 3   DAM01 v.2.5 module 4   EDS02 module 6   REF03 module 3  REF04 module 2</p> <p>11. Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF02 module 1</p> <p>12. Identify color difference (off-shade); determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 1</p> <p>13. Identify tape tracking; determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p> <p>14. Identify low gloss condition; determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3   REF04 module 2</p> <p>15. Identify poor adhesion; determine the cause(s) and correct the condition. HP-G, EDS02 module 6  REF03 module 3</p> <p>16. Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, microchecking, etc.); determine the cause(s) and correct the condition. HP-G, EDS02 module 6</p> <p>22. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p> <p>23. Identify chalking (oxidation); determine the cause(s) and correct the condition. HP-G, EDS02 module 6</p> <p>24. Identify bleed-through (staining); determine the cause(s) and correct the condition. HP-G, EDS02 module 6</p> <p>25. Identify pin-holing; determine the cause(s) and correct the condition. HP-G, EDS02 module 6</p> <p>26. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition. HP-I, REF04 module 2</p> <p>27. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition. HP-G, EDS02 module 6   REF03 module 3</p>

Course Code	Course Name	Essential Standards
		<p>Unit F. Final Detail</p> <ol style="list-style-type: none"> <li>1. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc. HP-G, TRM01 module 4</li> <li>2. Sand, buff and polish fresh or existing finish to remove defects as required. HP-I, REF04 module 2</li> <li>3. Clean interior, exterior, and glass. HP-I, REF04 module 3</li> <li>4. Clean body openings (door jambs and edges, etc.). HP-I, REF04 module 3</li> <li>5. Remove overspray. HP-I, EDS02 module 6   REF04 module 2</li> <li>6. Perform vehicle clean-up; complete quality control using a checklist. HP-I, REF04 module 3</li> </ol>
<b>Automotive Technology</b>		
6030	Automotive Technology 1	<p>F. Tools and Equipment</p> <ol style="list-style-type: none"> <li>1. Identify tools and their usage in automotive applications. P-1</li> <li>2. Identify standard and metric designation. P-1</li> <li>3. Demonstrate safe handling and use of appropriate tools. P-1</li> <li>4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment. P-1</li> <li>5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, and dial-caliper). P-1</li> </ol> <p>H. General Engine Repair</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Verify operation of the instrument panel engine warning indicators. P-1</li> <li>3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1</li> <li>4. Install engine covers using gaskets, seals, and sealers as required. P-1</li> <li>5. Verify engine mechanical timing. P-2</li> <li>6. Perform common fastener and thread repair to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle. P-2</p> <p>Engine Repair: Cylinder Head and Valve Train</p> <ol style="list-style-type: none"> <li>1. Adjust valves (mechanical or hydraulic lifters). P-32</li> <li>2. Identify components of the cylinder head and valve train. P-1</li> </ol>
6031	Automotive Technology 2	<p>J. Engine Repair: Lubrication and Cooling Systems</p> <ol style="list-style-type: none"> <li>1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine necessary action. P-1</li> <li>2. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1</li> <li>3. Remove, inspect, and replace thermostat and gasket/seal. P-1</li> <li>4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1</li> <li>5. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1</li> <li>6. Identify components of the lubrication and cooling systems. P-1</li> </ol> <p>S. General Suspension and Steering Systems</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1</li> <li>3. Identify suspension and steering system components and configurations. P-1</li> </ol> <p>T. Related Suspension and Steering Service Diagnosis and Repair</p> <ol style="list-style-type: none"> <li>1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-1</li> <li>2. Inspect power steering fluid level and condition. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification. P-2</p> <p>4. Inspect for power steering fluid leakage. P-1</p> <p>5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1</p> <p>U. Suspension And Steering: Wheels Alignment</p> <p>1. Perform pre-alignment inspection; measure vehicle ride height. P-1</p> <p>2. Describe alignment angles (camber, caster and toe). P-1</p> <p>V. Suspension and Steering: Wheels and Tires</p> <p>1. Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label. P-1</p> <p>2. Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS). P-1</p> <p>3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. P-1</p> <p>4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-1</p> <p>5. Inspect tire and wheel assembly for air loss; determine necessary action. P-1</p> <p>6. Repair tire following vehicle manufacturer approved procedure. P-1</p> <p>W. General Brake Systems</p> <p>1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS). P-1</p> <p>3. Install wheel and torque lug nuts. P-1</p> <p>4. Identify and Identify and interpret brake system concerns; determine needed action. P-1</p> <p>X. Brakes: Hydraulic Systems</p> <p>1. Describe proper brake pedal height, travel, and feet. P-1</p> <p>2. Check master cylinder for external leaks and proper operation. P-1</p>

Course Code	Course Name	Essential Standards
		<p>3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports. P-1</p> <p>4. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1</p> <p>5. Identify components of hydraulic brake warning light system. P-3</p> <p>6. Bleed and/or flush brake system. P-1</p> <p>7. Test brake fluid for contamination. P-1</p> <p>Y. Drum Brakes</p> <p>1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-1</p> <p>2. Refinish brake drum and measure final drum diameter; compare with specification. P-1</p> <p>3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1</p>
6032	Automotive Technology 3	<p>Y. Drum Brakes</p> <p>4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2</p> <p>5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-</p> <p>Z. Disc Brakes</p> <p>1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1</p> <p>2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.</p> <p>3. Remove and inspect, and/or replace brake pads and retaining hardware; determine necessary action. P-1</p> <p>4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks. P-1</p> <p>5. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1</p> <p>6. Remove and reinstall/replace rotor. P-1</p>

Course Code	Course Name	Essential Standards
		<p>7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-1</p> <p>8. Retract and re-adjust caliper piston on an integrated parking brake system. P-2</p> <p>9. Check brake pad wear indicator; determine needed action. P-1</p> <p>10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1</p> <p>AA. Brakes: Power-Assist Units</p> <p>1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2</p> <p>2. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1</p> <p>BB. Brakes: Related Systems (I.E. Wheel Bearings, Parking Brakes, Electrical)</p> <p>1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1</p> <p>2. Check parking brakes system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replaced as needed. P-2</p> <p>3. Check parking brake operation and parking brake indicator light system operation; determine needed action. P-1</p> <p>4. Check operation of brake stop light system. P-1</p> <p>5. Replace wheel bearing and race. P-2</p> <p>6. Inspect and replace wheel studs. P-1</p> <p>DD. General Electrical /Electronic Systems</p> <p>1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1</p> <p>3. Use wiring diagrams to trace electrical/electronic circuits. P-1</p>

Course Code	Course Name	Essential Standards
		<p>4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1</p>
6033	Automotive Technology 4	<p>CC. Brakes: Electronic Brake, Traction Control (Tcs), Stability Control (Esc) Systems</p> <ol style="list-style-type: none"> <li>1. Identify traction control/vehicle stability/control system components. P-3</li> <li>2. Describe the operation of a regenerative braking system. P-3</li> </ol> <p>DD. General Electrical/Electronic Systems</p> <ol style="list-style-type: none"> <li>5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1</li> <li>6. Use a test light to check operation of electrical circuits. P-2</li> <li>7. Use fused jumper wires to check operation of electrical circuits. P-2</li> <li>8. Measure key-off battery drain (parasitic draw). P-1</li> <li>9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1</li> <li>10. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair) P-1</li> <li>11. Identify electrical/electronic system components and configuration. P-1</li> </ol> <p>EE. Electrical/Electronic Systems: Battery Service</p> <ol style="list-style-type: none"> <li>1. Perform battery state-of-charge test; determine necessary action. P-1</li> <li>2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action. P-1</li> <li>3. Maintain or restore electronic memory functions. P-1</li> <li>4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1</li> <li>5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1</li> <li>6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1</li> <li>7. Identify safety precautions for high voltage systems on electric, hybrid-electric, and diesel vehicles. P-2</li> </ol>

Course Code	Course Name	Essential Standards
		<p>8. Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery. P-1</p> <p>9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-2</p> <p>FF. Electrical/Electronic Systems: Starting System</p> <ol style="list-style-type: none"> <li>1. Perform starter current draw test; determine necessary action. P-1</li> <li>2. Perform starter circuit voltage drop tests; determine necessary action. P-1</li> <li>3. Inspect and test starter relays and solenoids; determine necessary action. P-2</li> <li>4. Remove and install starter in a vehicle. P-1</li> <li>5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2</li> <li>6. Demonstrate knowledge of an automatic idle-stop/start-stop system. P-</li> </ol> <p>GG. Electrical/Electronic Systems: Charging System</p> <ol style="list-style-type: none"> <li>1. Perform charging system output test; determine necessary action. P-1</li> <li>2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1</li> <li>3. Remove, inspect, and/or replace generator (alternator). P-2</li> <li>4. Perform charging circuit voltage drop tests; determine necessary action. P-2</li> </ol> <p>HH. Electrical/Electronic Systems: Lighting, Instrument Cluster, Driver Information, And Body Electrical Systems</p> <ol style="list-style-type: none"> <li>1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1</li> <li>2. Aim headlights. P-2</li> <li>3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2</li> <li>4. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-2</li> <li>5. Remove and reinstall door panel. P-1</li> <li>6. Describe the operation of keyless entry/remote-start systems. P-3</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1</p> <p>8. Verify windshield wiper and washer operation; replace wiper blades. P-1</p> <p>II. General Heating, Ventilation, And Air Conditioning (Hvac)</p> <p>1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Identify heating, ventilation and air conditioning (HVAC) components and configuration. P-1</p> <p>JJ. Hvac: Refrigeration System Components</p> <p>1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary action. P-1</p> <p>2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. P-2</p> <p>3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-</p> <p>KK. Heating, Ventilation, And Engine Cooling Systems</p> <p>1. Inspect engine cooling and heater systems hoses and pipes; determine necessary action. P-1</p> <p>LL. HVAC: Operating Systems and Related Controls</p> <p>1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action.</p> <p>2. Identify the source of A/C system odors</p> <p>MM. General Engine Performance</p> <p>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Perform engine absolute manifold pressure tests (vacuum/boost); document results. P-2</p> <p>3. Perform cylinder power balance test; document results. P-2</p> <p>4. Perform cylinder cranking and running compression tests; document results. P-2</p> <p>5. Perform cylinder leakage test; document results. P-2</p>

Course Code	Course Name	Essential Standards
		<p>6. Verify engine operating temperature. P-1  7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1</p> <p>NN. Computerized Controls  1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1  2. Describe the use of the OBD monitors for repair verification. P-1</p> <p>OO. Fuel, Air Induction, and Exhaust Systems  1. Replace fuel filter(s) where applicable. P-2  2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1  3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1  4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action. P-1  5. Check and refill diesel exhaust fluid (DEF). P-2</p> <p>PP. Emissions Control Systems  1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action. P-2</p>
<b>Diesel Engine Technology</b>		
6310	Diesel Engine Technology 1	<p>F. General Diesel Engine Repair  Proficient MD/HD diesel professionals demonstrate general diesel engine repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1  2. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant. P-1</p>

Course Code	Course Name	Essential Standards
		<p>3. Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action. P-1</p> <p>4. Check (diagnose) engine operation (starting and running) including: noise vibration, smoke, etc. Determine needed action. P-2</p> <p>5. Use appropriate electronic service tool(s) and procedures to check, record and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1</p> <p>6. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking. P-1</p> <p>7. *Check engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. P-2 (TST)</p> <p>8. *Check engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and/or shut down problems; determine needed action. P-2 (TST)</p> <p><b>G. DIESEL ENGINE REPAIR: CYLINDER HEAD AND VALVE TRAIN</b></p> <p>Proficient MD/HD diesel professionals demonstrate cylinder head and valve train repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action. P-1</p> <p>2. *Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. P-2 (TST)</p> <p>1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action. P-1</p> <p>2. *Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. P-2 (TST)</p> <p><b>H. Diesel Engines: Engine Block</b></p>

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate engine block repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect crankshaft vibration damper; inspect engine mounts. P-1</li> <li>2. *Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components. P-1 (TST)</li> <li>3. *Perform crankcase pressure test. P-1 (TST)</li> <li>4. *Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface; measure flywheel housing face and bore runouts; determine needed action. P-2 (TST)</li> <li>5. *Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. P-2 (TST)</li> </ol> <p>H. Diesel Engines: Engine Block</p> <p>Proficient MD/HD diesel professionals demonstrate engine block repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect crankshaft vibration damper; inspect engine mounts. P-1</li> <li>2. *Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components. P-1 (TST)</li> <li>3. *Perform crankcase pressure test. P-1 (TST)</li> <li>4. *Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface; measure flywheel housing face and bore runouts; determine needed action. P-2 (TST)</li> <li>5. *Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. P-2 (TST)</li> </ol> <p>J. Diesel Engine Repair: Cooling Systems</p> <p>Proficient MD/HD diesel professionals demonstrate cooling systems repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p>

Course Code	Course Name	Essential Standards
		<ol style="list-style-type: none"> <li>1. Check engine coolant type, level, condition, and test coolant for freeze protection and additive package concentration. P-1</li> <li>2. Verify coolant temperature, check operation of temperature and level sensors, gauge, and/or sending unit. P-1</li> <li>3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. P-1</li> <li>4. Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling systems. P-1</li> <li>5. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1</li> <li>6. Inspect water pump, hoses, and clamps. P-1</li> <li>7. Inspect, and pressure test cooling systems(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings. P-1</li> <li>8. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud. P-1</li> <li>9. Identify engine block heater(s). P-2</li> <li>10. *Diagnose engine coolant consumption; determine needed action. P-1 (TST)</li> <li>11. *Inspect thermostat(s), by-passes, housing (s), and seals; replace as needed. P-1 (TST)</li> <li>12. *Inspect turbocharger cooling systems. P-2 (TST)</li> </ol> <p>K. Diesel Engine Repair: Air Induction And Exhaust Systems  Proficient MD/HD diesel professionals demonstrate air induction and exhaust system repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect turbocharger(s), wastegate(s), and piping systems. P-2</li> <li>2. Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable). P-1</li> <li>3. Inspect intake manifold, gaskets, and connections. P-1</li> <li>4. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Inspect crankcase ventilation system; service as needed. P-1</p> <p>6. *Demonstrate knowledge of exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action. P-1 (TST)</p> <p>7. *Perform air intake system restriction and leakage tests; determine needed action. P-1 (TST)</p> <p>8. Perform intake manifold pressure (boost) test; determine needed action. P-3</p> <p>9. *Check exhaust back pressure. P-3 (TST)</p> <p>10. *Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic). P-2 (TST)</p> <p>11. *Demonstrate knowledge of charge air cooler operation and testing. P-1 (TST)</p> <p>12. *Demonstrate knowledge of exhaust aftertreatment systems, operation, and components. P-1 (TST)</p> <p>13. *Inspect and/or replace preheater/inlet air heater or glow plug system and controls. P-2 (TST)</p> <p><b>L. Diesel Engine Repair: Fuel Systems</b>  Proficient MD/HD diesel professionals demonstrate fuel system repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Check fuel level and condition; determine needed action. P-1</p> <p>2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings; determine needed action. P-1</p> <p>3. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware); determine needed action. P-1</p> <p>4. Replace fuel filter; prime and bleed fuel system. P-1</p> <p>5. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware). P-1</p>

Course Code	Course Name	Essential Standards
		<p>6. *Demonstrate knowledge and understanding of the different types of fuel systems. P-1 (TST)</p> <p>7. *Perform fuel supply and return system tests, determine needed action. P-1 (TST)</p> <p>8. *Perform cylinder contribution test using electronic service tool(s). P-1 (TST)</p> <p><b>M. Diesel Engine Repair: Engine Brakes</b>  Proficient MD/HD diesel professionals demonstrate engine brakes repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings. P-1</li> <li>2. *Inspect and adjust engine compression and/or exhaust brake systems; determine needed action. P-2 (TST)</li> <li>3. *Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids; determine needed action. P-2 (TST)</li> </ol> <p><b>N. General Electrical/ Electronic Systems</b>  Proficient MD/HD diesel professionals demonstrate general electrical/electronic systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1</li> <li>3. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance. P-1</li> <li>4. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1</li> <li>5. Use wiring diagrams to trace electrical/electronic circuits. P-1</li> <li>6. Measure parasitic (key-off) battery drain. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>7. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses. P-1</p> <p>8. Inspect, repair (including solder repair), and/or replace connectors, seals, terminal ends, and wiring; verify proper routing and securement. P-1</p> <p>9. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-2</p> <p>10. Check for malfunctions caused by faults in the data bus communications network. P-2</p> <p>11. Identify electrical/electronic system components and configuration. P-1</p> <p>12. *Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment; interpret readings; determine needed repairs. P-2 (TST)</p> <p><b>O. Brakes: General Repair</b>  Proficient MD/HD diesel professionals demonstrate general brake repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Identify brake system components and configurations (including air and hydraulic systems, parking brakes, power assist, and vehicle dynamic brake systems). P-1</p> <p>3. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic). P-1</p> <p>4. *Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multi-meter (DMM) readings. P-1 (TST)</p>
6311	Diesel Engineering Technology 2	<p><b>F. Air Brakes: Air Supply and Service Systems</b>  Proficient MD/HD diesel professionals demonstrate air brake air supply and service system repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Inspect air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand</p>

Course Code	Course Name	Essential Standards
		<p>brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety). P-1</p> <ol style="list-style-type: none"> <li>2. *Test gauge operation and readings; test low pressure warning alarm operation; perform air-supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination; determine needed action. P-1 (TST)</li> <li>3. *Demonstrate knowledge and understanding of air supply and service system components and operations. P-1 (TST)</li> <li>4. *Inspect air compressor drive hear components (gears, belts, tensioners, and/or couplings); determine needed action. P-3 (TST)</li> <li>5. *Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. P-1 (TST)</li> <li>6. *Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; determine needed action. P-1 (TST)</li> <li>7. *Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; determine needed action. P-1 (TST)</li> <li>8. *Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; determine needed action. P-1 (TST)</li> </ol> <p><b>G. Air Brakes: Mechanical/Foundation Brake System</b>  Proficient MD/HD diesel professionals demonstrate mechanical/foundation brake system repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets, determine needed action. P-1</li> <li>2. Identify slack adjuster types; inspect slack adjusters, determine needed action. P-1</li> <li>3. Check camshafts (s-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs, determine needed action. P-1</li> <li>4. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action. P-1</p> <p>6. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake linking thickness; inspect brake lining condition; determine needed action. P-1</p> <p>7. *Identify concerns related to the mechanical/foundation brake system including poor stopping, brake noise, premature wear, pulling, grabbing, or dragging; determine needed action. P-1 (TST)*</p> <p><b>H. Air Brakes: Parking Brake System</b>  Proficient MD/HD diesel professionals demonstrate parking brake system repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Inspect and check parking (spring) brake chamber for leaks; determine needed action. P-1</p> <p>2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; determine needed action. P-1</p> <p>3. Inspect test parking (spring) brake application and release valve; determine needed action. P-1</p> <p>4. Manually release (cage) and reset (uncage) parking (spring) brakes. P-1</p> <p>5. Identify and test anti-compounding brake function; determine needed action. P-2</p> <p><b>I. Hydraulic Brake Systems</b>  Proficient MD/HD diesel professionals demonstrate hydraulic brake systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Check master cylinder fluid level and condition; determine proper fluid type for application. P-1</p> <p>2. Inspect hydraulic brake system components for leaks and damage. P-1</p> <p>3. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feet. P-1</p>

Course Code	Course Name	Essential Standards
		<p>4. *Identify poor stopping, premature wear, pulling, dragging, imbalance, or poor pedal feel caused by problems in the hydraulic system; determine needed action. P-2 (TST)</p> <p>5. *Test master cylinder for internal/external leaks and damage; replace as needed. P-2 (TST)</p> <p>6. *Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; determine needed action. P-2 (TST)</p> <p>7. *Test brake pressure differential valve; test warning light circuit switch, bulbs/LEDs, wiring, and connectors; determine needed action. P-2 (TST)</p> <p>8. *Bleed and/or flush hydraulic brake system. P-2 (TST)</p> <p><b>J. Hydraulic Brakes: Mechanical/Foundation Brake System</b>  Proficient MD/HD diesel professionals demonstrate hydraulic brakes' mechanical and foundation brake systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine action needed. P-1</li> <li>2. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; determine needed action. P-1</li> <li>3. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action. P-1</li> </ol> <p><b>K. Hydraulic Brakes: Parking Brake System</b>  Proficient MD/HD diesel professionals demonstrate hydraulic brakes parking brake system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check parking brake operation; inspect parking brake application and holding devices; adjust, repair, and/or replace as needed. P-1</li> </ol> <p><b>L. Brakes: Power Assist Systems</b></p>

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate brake power assist system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable). P-1</li> <li>2. Check operation of emergency (back-up/reserve) brake assist system. P-1</li> <li>3. *Identify concerns related to the power assist system (vacuum or hydraulic), including stopping problems caused by the brake assist/booster system; determine needed action. P-2 (TST)</li> <li>4. *Inspect, test, repair, and/or replace hydraulic brake assist/booster systems, hoses, and control valves. P-1 (TST)</li> </ol> <p>M. Vehicle Dynamic Brake Systems (Air And Hydraulic): Antilock Brake System (Abs), Automatic Traction Control (Atc) System, And Electronic Stability Control (Esc) System</p> <p>Proficient MD/HD diesel professionals demonstrate various power brake systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light. P-1</li> <li>2. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation. P-2</li> <li>3. *Identify stopping concerns related to the vehicle dynamic brake systems; ABS, ATC, and ESC; determine needed action. P-2 (TST)</li> <li>4. *Diagnose problems in the vehicle dynamic brake control systems; determine needed action. P-2 (TST)</li> <li>5. *Check and test operation of vehicle dynamic brake system (air and hydraulic) mechanical and electrical components; determine needed action. P-1 (TST)</li> <li>6. *Test vehicle/wheel speed sensors and circuits; adjust, repair, and/or replace as needed. P-1 (TST)</li> <li>7. *Bleed ABS hydraulic circuits. P-2 (TST)</li> <li>8. *Verify power line carrier (PLC) operation. P-3 (TST)</li> </ol>

Course Code	Course Name	Essential Standards
		<p><b>N. Brakes: Wheel Bearings</b>  Proficient MD/HD diesel professionals demonstrate brakes-related systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings, inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method. P-1</li> <li>2. Identify, inspect, and/or replace unitized/preset hub bearing assemblies. P-2</li> </ol> <p><b>N. Suspension and Steering Systems</b>  Proficient MD/HD diesel professionals demonstrate general suspension and steering systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Disable and enable supplemental restraint system (SRS); verify indicator lap operation. P-1</li> <li>3. Identify suspension and steering system components and configuration. P-1</li> <li>4. *Use appropriate electronic service tools(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1 (TST)</li> </ol> <p><b>O. Suspension and Steering Systems: Steering Column</b>  Proficient MD/HD diesel professionals demonstrate suspension and steering column systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), bearings, bushings, and seals; phase steering shaft. P-1</li> <li>2. Check operation of tilt and telescoping steering column. P-1</li> <li>3. Check cab mounting. P-2</li> </ol>

Course Code	Course Name	Essential Standards
		<p>4. *Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. P-1 (TST)</p> <p>5. *Inspect, test, replace, and calibrate steering angle sensor. P-2 (TST)</p> <p>P. Suspension and Steering Systems: Steering Pump and Gear Units  Proficient MD/HD diesel professionals demonstrate suspension and steering pump and gear unit systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks. P-1</li> <li>2. Flush and refill power steering system; purge air from system. P-1</li> <li>3. Inspect and/or replace power steering system cooler, lines, hoses, clamps, mountings, and fittings. P-2</li> <li>4. *Identify causes of power steering system noise, binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems. P-1 (TST)</li> <li>5. *Inspect, service, and/or replace power steering reservoir, seals, and gaskets. P-2 (TST)</li> <li>6. *Inspect and/or replace power steering gear(s) (single and/or dual) and mountings. P-2 (TST)</li> </ol> <p>Q. Suspension and Steering: Steering Linkage  Proficient MD/HD diesel professionals demonstrate suspension and steering linkage diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components; lubricate as needed. P-1</li> </ol> <p>R. Suspension and Steering: Suspension Systems</p>

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate suspension systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect shock absorbers, bushings, brackets, and mounts. Determine needed action. P-1</li> <li>2. Inspect leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action. P-1</li> <li>3. Inspect axle and axle aligning devices such as: radius rods, track bars, stabilizers bars, and torque arms, inspect related bushings, mounts, and shims. P-1</li> <li>4. Inspect tandem suspension equalizer components. P-3</li> <li>5. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings, check and record ride height. P-1</li> <li>6. Inspect air springs, mounting plats, springs suspension arms, and bushings. P-1</li> <li>7. *Inspect, test, repair, and/or replace air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height. P-1 (TST)</li> <li>8. *Inspect and service kingpins, steering knuckle bushings, locks, bearing, seals, and covers. P-1 (TST)</li> <li>9. *Measure, record, and adjust ride height; determine needed action. P-1 (TST)</li> <li>10. *Identify rough ride problems. P-3 (TST)</li> </ol> <p>S. Suspension and Steering: Wheel Alignment</p> <p>Proficient MD/HD diesel professionals demonstrate knowledge of alignment angles as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Demonstrate understanding of alignment angles. P-1</li> <li>2. *Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems P-1(TST)</li> <li>3. *Check and record camber. P-2 (TST)</li> <li>4. *Check and record caster. P-2 (TST)</li> <li>5. *Check, record, and adjust toe settings. P-2 (TST)</li> <li>6. *Check rear axle(s) alignment (thrustline/centerline) and tracking. P-2 (TST)</li> <li>7. *Identify turning/Ackerman angle (toe-out-on-turns) problems. P-3 (TST)</li> </ol>

Course Code	Course Name	Essential Standards
		<p>8. *Check front axle alignment (centerline). P-2 (TST)</p> <p>T. Suspension and Steering: Wheels and Tires  Proficient MD/HD diesel professionals demonstrate suspension systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure. P-1</li> <li>2. Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems. P-2</li> <li>3. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer's specification using torque wrench. P-1</li> <li>4. *Inspect tire and wheel for proper application (size, load range, position, and design); determine needed action. P-2 (TST)</li> </ol> <p>U. Suspension And Steering: Frame and Coupling Devices  Proficient MD/HD diesel professionals demonstrate suspension systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings. P-1</li> <li>2. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage. P-1</li> <li>3. *Inspect and install frame hangers, brackets, and cross members; determine needed action. P-3 (TST)</li> <li>4. *Inspect, repair, or replace pintle hooks and draw bars (if applicable). P-2 (TST)</li> <li>5. *Inspect, service, and/or adjust sliding fifth wheel, tracks, stops, locking system, cylinders, springs, lines, hoses, and controls. P-2 (TST)</li> </ol>
6312	Diesel Engineering Technology 3	F. Drive Train: General Repair

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate general drive train repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. *Identify drive train components, transmission type, and configuration. P-1 (TST)</li> <li>3. *Use appropriate electronic service tool(s) and procedures to diagnose problems, check, record, and clear diagnostic codes, interpret digital multimeter (DMM) readings. P-1 (TST)</li> </ol> <p><b>G. Drive Train: Clutch Repair</b></p> <p>Proficient MD/HD diesel professionals demonstrate drive train clutch repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check and adjust clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action. P-1</li> <li>2. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action. P-1</li> <li>3. *Inspect, adjust, repair, and/or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. P-2 (TST)</li> <li>4. *Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. P-1 (TST)</li> <li>5. *Inspect, adjust, and/or replace single-disc clutch pressure plate and clutch disc. P-1 (TST)</li> <li>6. *Inspect, adjust, and/or replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. P-1 (TST)</li> <li>7. *Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; determine needed action. P-1 (TST)</li> <li>8. *Inspect, adjust, and/or replace self-adjusting/continuous-adjusting clutch mechanisms. P-1 (TST)</li> <li>9. *Inspect and/or replace pilot bearing. P-1 (TST)</li> </ol>

Course Code	Course Name	Essential Standards
		<p>P. Drive Train: Transmission Repair</p> <p>Proficient MD/HD diesel professionals demonstrate drive train transmission repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect transmission shifter and linkage; inspect transmission mounts, insulators, and mounting bolts. P-1</li> <li>2. Inspect transmission for leakage; determine needed action. P-1</li> <li>3. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action. P-1</li> <li>4. Check transmission fluid level and condition; determine needed action. P-1</li> <li>5. Inspect transmission breather; inspect transmission oil filters, coolers and related components; determine needed action. P-2</li> <li>6. Inspect speedometer components. P-2</li> <li>7. Inspect and test function of REVERSE light, neutral start, and warning device circuits. P-1</li> <li>8. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts. P-3</li> <li>9. *Inspect, adjust, and replace transmission covers, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. P-2 (TST)</li> <li>10. *Identify causes of transmission noise, shifting concerns, lockup, jumping out-of-gear, overheating, and vibration problems. P-1 (TST)</li> <li>11. *Inspect, test, repair, and/or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. P-2(TST)</li> <li>12. *Remove and reinstall transmission. P-2 (TST)</li> <li>13. *Inspect input shaft, gear, spacers, bearings, retainers, and slingers. P-3 (TST)</li> <li>14. *Inspect and test transmission temperature gauge, wiring harnesses, and sensor/sending unit. P-2 (TST)</li> <li>15. *Inspect operation of automatic transmission, components, and controls; diagnose automatic transmission system problems; determine needed action. P-2 (TST)</li> <li>16. *Inspect operation of automated mechanical transmission, components, and controls; diagnose automated mechanical transmission system problems; determine needed action. P-2 (TST)</li> </ol>

Course Code	Course Name	Essential Standards
		<p><b>Q. Drive Train: Driveshaft And Universal Joints</b>  Proficient MD/HD diesel professionals demonstrate driveshaft and universal joints repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect, service, and/or replace drive shafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts. P-1</li> <li>2. *Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action. P-1 (TST)</li> <li>3. *Inspect driveshaft center support bearings and mounts; determine needed action. P-1 (TST)</li> <li>4. *Measure driveline angles; determine needed action. P-2 (TST)</li> </ol> <p><b>R. Drive Train: Drive Axles</b>  Proficient MD/HD diesel professionals demonstrate drive axles repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check for fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs. P-1</li> <li>2. Check drive axle fluid level and condition; check drive axle filter; determine needed action. P-1</li> <li>3. Inspect air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. P-2</li> <li>4. Inspect drive axle shafts; determine needed action. P-2</li> <li>5. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action. P-1</li> <li>6. *Inspect, repair, and replace drive axle lubrication system pump, troughs, collectors, slingers, tubes, and filters. P-3 (TST)</li> <li>7. *Identify causes of drive axle(s) drive unit noise and overheating problems. P-2 (TST)</li> <li>8. *Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action. P-2 (TST)</li> </ol>

Course Code	Course Name	Essential Standards
		<p>9. *Remove and replace differential carrier assembly. P-2</p> <p>10. *Identify causes of drive axle wheel bearing noise and check for damage; perform needed action. P-1 (TST)</p> <p><b>R. General Heating, Ventilation, and Air Conditioning (HVAC)</b>  Proficient MD/HD diesel professionals demonstrate general heating, ventilation, and air conditioning diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Identify heating, ventilation and air conditioning (HVAC) components and configuration. P-1</li> <li>3. Use appropriate electronic service tools(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1</li> <li>4. *Identify and interpret heating and air condition problems. P-1 (TST)</li> <li>5. *Identify refrigerant type; test for contamination; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1 (TST)</li> <li>6. *Demonstrate understand of A/C system performance test. P-1 (TST)</li> <li>7. *Demonstrate understanding of A/C system leak test. P-1 (TST)</li> <li>8. *Inspect condition of refrigerant oil removed from A/C system; determine needed action. P-1 (TST)</li> <li>9. *Determine oil and oil capacity for system application and/or component replacement. P-1 (TST)</li> </ol> <p><b>S. HVAC: Refrigeration System Components</b>  Proficient MD/HD diesel professionals demonstrate refrigeration system components diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; verify belt alignment. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>2. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable). P-1</p> <p>3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-1</p> <p>4. Inspect receiver/drier or accumulator/drier; determine needed action. P-1</p> <p>5. *Inspect A/C compressor and clutch assembly; check compressor clutch air gap; determine needed action. P-1 (TST)</p> <p>6. *Inspect AC system hoses, lines, fittings, O-rings, seals, and service valves; determine needed action. P-1 (TST)</p> <p>7. *Inspect expansion valve or orifice (expansion) tube; determine needed action. P-1 (TST)</p> <p>8. *Inspect evaporator housing water drain; determine needed action. P-1 (TST)</p> <p>9. *Understand A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation. P-2 (TST)</p> <p>10. *Understand procedure to remove and reinstall evaporator. P-2 (TST)</p> <p>11. *Understand procedure to inspect and/or replace condenser. P-2 (TST)</p> <p>T. HVAC: Heating, Ventilation, and Engine Cooling Systems  Proficient MD/HD diesel professionals demonstrate heating, ventilation, and engine cooling systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Inspect engine cooling and heater systems hoses and pipes; determine necessary action. P-1</p> <p>2. Inspect HVAC system-heater ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1</p> <p>3. Identify the source of A/C system odors; determine needed action. P-2</p> <p>4. *Identify temperature control problems in the HVAC system; determine needed action. P-2 (TST)</p> <p>5. *Understand procedure to remove, inspect, reinstall, and/or replace engine coolant and heater system components. P-2 (TST)</p> <p>U. HVAC: Operating Systems and Related Controls</p>

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate HVAC operating systems and related controls diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Verify HVAC blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action. P-1</li> <li>2. *Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices. P-1 (TST)</li> <li>3. *Demonstrate understanding of A/C compressor clutch control systems. P-2 (TST)</li> <li>4. *Demonstrate understanding of vacuum, mechanical, and electrical components and controls of the HVAC system. P-2 (TST)</li> </ol> <p>V. HVAC: Refrigerant Recover, Recycling, and Handling</p> <p>Proficient MD/HD diesel professionals demonstrate HVAC refrigerant recovery, recycling, and handling skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. *Understand correct use and maintenance of refrigerant handling equipment. P-1 (TST)</li> <li>2. *Understand how to identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1 (TST)</li> </ol>
6313	Diesel Engineering Technology 4	<p>F. Electrical/Electronic Systems: Battery System</p> <p>Proficient MD/HD diesel professionals demonstrate battery system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Identify battery type and system configuration. P-1</li> <li>2. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action. P-1</li> <li>3. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action. P-1</li> <li>4. Charge battery using appropriate method for battery type. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply. P-1</p> <p>6. *Check how voltage disconnect (LVD) systems; determine needed action. P-2 (TST)</p> <p>7. *Inspect, lean, and service battery; replace as needed. P-1 (TST)</p> <p>8. *Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed. P-1 (TST)</p> <p>9. *Test and clean battery cables and connectors; repair or replace as needed. P-1 (TST)</p> <p>10. *Identify electrical/ modules, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery. P-3 (TST)</p> <p><b>G. Electrical/Electronic Systems: Starting System</b>  Proficient MD/HD diesel professionals demonstrate starting system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Demonstrate understanding of starter system operation. P-1</li> <li>2. Perform starter circuit cranking voltage and voltage drop tests. Determine needed action. P-1</li> <li>3. Inspect starter control circuit switches, relays, connectors, terminals, wires, and harnesses (including over-crank protection); determine needed action. P-1</li> <li>4. *Identify causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems; determine needed action. P-1 (TST)</li> <li>5. *Perform starter current draw tests; determine needed action. P-3 (TST)</li> <li>6. *Remove and replace starter; inspect flywheel ring gear or flex plate. P-1 (TST)</li> </ol> <p><b>H. Electrical/Electronic Systems: Charging System</b>  Proficient MD/HD diesel professionals demonstrate charging system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Identify and understand operation of the generator (alternator). P-1</li> <li>2. Check instrument panel mounted voltmeters and/or indicator lamps; determine needed action. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Inspect generator (alternator) drive belt condition; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment; determine needed action. P-1</p> <p>4. Inspect cables, wires, and connectors in the charging circuit; determine needed action. P-1</p> <p>5. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action. P-1</p> <p>6. *Perform charging circuit voltage drop tests; determine needed action. P-1 (TST)</p> <p>7. *Remove, inspect, and/or replace generator (alternator). P-1 (TST)</p> <p><b>I. Electrical/Electronic Systems: Lighting Systems</b>  Proficient MD/HD diesel professionals demonstrate lighting system diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Inspect for brighter-than-normal, intermittent, dim, or no-light operation; determine needed action. P-1</p> <p>2. Test, replace, and aim headlights. P-1</p> <p>3. Inspect cables, wires, and connectors in the lighting system. P-1</p> <p>4. Inspect and diagnose tractor-to-tractor multi-wire connectors, cables, and holders. Determine needed action. P-2</p> <p>5. *Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action. P-2 (TST)</p> <p>6. *Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action. P-2 (TST)</p> <p>7. *Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting systems; determine needed action. P-2 (TST)</p> <p><b>J. Electrical/Electronic Systems: Instrument Cluster And Driver Information Systems</b>  Proficient MD/HD diesel professionals demonstrate instrument cluster and driver information systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <p>1. Check gauge and warning indicator operation. P-1</p>

Course Code	Course Name	Essential Standards
		<p>2. Identify faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information system, and warning systems; determine needed action. P-2</p> <p>3. *Inspect electronic speedometer, odometer, and tachometer systems. P-3 (TST)*</p> <p>4. *Understand how to recycle, label, and store refrigerant. P-1 (TST)</p> <p><b>K. General Cab</b>  Proficient MD/HD diesel professionals demonstrate general cab diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1</li> </ol> <p><b>L. CAB: Instruments and Controls</b>  Proficient MD/HD diesel professionals demonstrate cab instruments and controls diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instructions; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable). P-1</li> <li>2. Check operation of all accessories. P-1</li> <li>3. Understand operation of auxiliary power unit (APU)/electric power unit. (EPU). P-3</li> </ol> <p><b>M. CAB: Safety Equipment</b></p>

Course Code	Course Name	Essential Standards
		<p>Proficient MD/HD diesel professionals demonstrate cab safety equipment diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check operation of horns (electric and air); check warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades and arms. P-1</li> </ol> <p><b>N. CAB: Hardware</b>  Proficient MD/HD diesel professionals demonstrate cab hardware diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Check operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass. P-1</li> <li>2. Record all physical damage. P-1</li> <li>3. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables. P-2</li> <li>4. Inspect cab mountings, hinges, latches, linkages, and ride height. P-1</li> <li>5. Inspect quarter fender, mud flaps, and brackets. P-1</li> </ol> <p><b>O. General Hydraulics (Optional Per Advisory Board Recommendation)</b>  Proficient MD/HD diesel professionals demonstrate general hydraulics systems diagnostic and repair skills as needed in their role. The following accountability criteria are considered essential for students in the Diesel Engine Repair Technology program of study.</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins. P-3</li> <li>2. Verify placement of equipment/component safety labels and placards; determine needed action. P-3</li> </ol>

Course Code	Course Name	Essential Standards
		3. Identify hydraulic system components; locate filtration system components; service filters and breathers. P-3 4. Check fluid level and condition; take a hydraulic fluid sample for analysis. P-3 5. Inspect hoses and connection for leaks, proper routing, and proper protection; determine needed action. P-3
<b>Power Equipment Technology</b>		
6300	Power Equipment Technology 1	F. Principles of Engine Operation, Two-and Four-Stroke Engines 1. Identify four-stroke engine components and their operations. 2. Identify two-stroke engine components and their operations. 3. Describe the operation of engine systems.  G. Fuel System Service 1. Service or replace a fuel filter. 2. Clean fuel tank and lines. 3. Service and adjust a vacuum-type carburetor. 4. Service and adjust a float-type carburetor. 5. Service and adjust a diaphragm-type carburetor. 6. Remove and replace a fuel pump. 7. Remove and replace primer bulb. 8. Identify/Test level of ethanol. 9/ Remove and replace fuel shut-off switch. 10. Identify and test anti-after fire solenoid  H. Ignition System Service 1. Gauge and replace a spark plug. 2. Remove and replace a flywheel using proper tools. 3. Test and replace an ignition coil. 4. Adjust armature air gap. 5. Test and replace an ignition kill wire.

Course Code	Course Name	Essential Standards
		<ul style="list-style-type: none"> <li>6. Replace a diode assembly.</li> <li>7. Troubleshoot a magneto ignition system.</li> <li>8. Remove and replace a safety switch.</li> <li>9. Remove and replace a brake band assembly</li> </ul>
6301	Power Equipment Technology 2	<ul style="list-style-type: none"> <li>I. Engine Disassembly and Inspection               <ul style="list-style-type: none"> <li>1. Disassemble and inspect engine components.</li> <li>2. Measure engine wear with precision measuring instruments.</li> <li>3. Grind valves and valve seats.</li> <li>4. Lap valves with grinding compound.</li> <li>5. Deglaze and clean a cylinder.</li> <li>6. Repair damaged threads using tap and die set.</li> <li>7. Repair damaged threads using thread insert.</li> <li>8. Remove and replace oil seals.</li> <li>9. Replace a crankshaft.</li> <li>10. Install piston rings.</li> <li>11. Replace a piston and connecting rod assembly.</li> <li>12. Install valve lifters.</li> <li>13. Replace a camshaft.</li> <li>14. Replace an oil dipper, slinger, or pump.</li> <li>15. Install a crankcase cover or sump</li> <li>16. Adjust and install valves.</li> <li>17. Install a cylinder head.</li> <li>18. Service a crankcase breather.</li> <li>19. Install a short block assembly</li> </ul> </li> <li>J. Starting System Service               <ul style="list-style-type: none"> <li>1. Remove and replace a starter spring.</li> <li>2. Remove and replace a starter clutch.</li> <li>3. Remove and replace a rope/starter pulley.</li> <li>4. Remove and replace starter pawls.</li> </ul> </li> </ul>

Course Code	Course Name	Essential Standards
		<p>5. Remove and replace a starter cup. 6. Remove and replace a starter rope.</p> <p><b>K. ELECTRICAL SYSTEMS SERVICE</b> 1. Service, test, and replace a battery. 2. Troubleshoot a starting circuit. 3. Perform a starter amperage draw test</p> <p><b>L. Drive Systems</b> 1. Remove and replace a centrifugal clutch. 2. Remove and replace an electric PTO.</p> <p><b>M. Shop Service Management</b> 1. Determine parts numbers from an illustrated parts list. 2. Update replacement parts numbers and prices using catalog. 3. Determine parts numbers using digital media</p> <p><b>N. General Manual Drive Train and Axles Diagnosis and Repair</b>  1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1 2. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. P-1</p> <p><b>O. Manual Drive Chain: Clutches</b> 1. Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification. P-1 2. Check for hydraulic system leaks. P-1</p>

Course Code	Course Name	Essential Standards
6302	Power Equipment Technology 3	<p>K. Electrical Systems Service</p> <ol style="list-style-type: none"> <li>4. Replace a starter motor.</li> <li>5. Remove and replace alternator or starter motor bearing or brushes.</li> <li>6. Troubleshoot a charging circuit.</li> </ol> <p>L. Drive Systems</p> <ol style="list-style-type: none"> <li>3. Repair a belt clutch.</li> <li>4. Repair and adjust a belt drive assembly.</li> <li>5. Repair a friction drive.</li> </ol> <p>M. Shop Service Management</p> <ol style="list-style-type: none"> <li>4. Estimate total cost of repairs.</li> <li>5. Complete a work order form.</li> <li>6. Complete a warranty form.</li> <li>7. Role-play various customer interactions.</li> </ol> <p>N. General Manual Drive Train And Axles Diagnosis And Repair</p> <ol style="list-style-type: none"> <li>3. Check fluid condition; check for leaks. P-2</li> <li>4. Identify manual drive train and axle components and configuration. P-1</li> </ol> <p>Q. Manual Drive Train: Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (Cv) Joints (Front, Rear, All, and Four-Wheel Drive)</p> <ol style="list-style-type: none"> <li>1. Inspect, remove, and/or replace bearings, hubs, and seals. P-2</li> <li>2. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. P-2</li> <li>3. Inspect locking hubs. P-3</li> <li>4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2</li> </ol> <p>R. Manual Drive Train: Differential Case Assembly</p> <ol style="list-style-type: none"> <li>1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>1. Clean and inspect differential case; check for leaks; inspect housing vent. P-1 2</p> <p>2. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification. P-1 3</p> <p>3. Drain and refill differential housing. P-1</p> <p>4. Inspect and replace drive axle wheel studs. P-1</p> <p>S. General Suspension and Steering Systems</p> <p>1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1</p> <p>3. Identify suspension and steering system components and configurations. P-1</p> <p>U. Suspension and Steering: Wheels Alignment</p> <p>1. Perform pre-alignment inspection; measure vehicle ride height. P-1</p> <p>2. Describe alignment angles (camber, caster and toe). P-1</p> <p>V. Suspension and Steering: Wheels and Tires</p> <p>1. Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label. P-1</p> <p>2. Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS). P-1</p> <p>3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. P-1</p> <p>4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-1</p> <p>5. Inspect tire and wheel assembly for air loss; determine necessary action. P-1</p> <p>6. Repair tire following vehicle manufacturer approved procedure. P-1</p> <p>7. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps. P-2</p>

Course Code	Course Name	Essential Standards
		<p>8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure. P-1</p> <p>W. General Brake Systems</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS). P-1</li> <li>3. Install wheel and torque lug nuts. P-1</li> <li>4. Identify and Identify and interpret brake system concerns; determine needed action. P-1</li> </ol> <p>X. Brakes: Hydraulic Systems</p> <ol style="list-style-type: none"> <li>1. Describe proper brake pedal height, travel, and feet. P-1</li> <li>2. Check master cylinder for external leaks and proper operation. P-1</li> <li>3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports. P-1</li> <li>4. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1</li> <li>5. Identify components of hydraulic brake warning light system. P-3</li> <li>6. Bleed and/or flush brake system. P-1</li> <li>7. Test brake fluid for contamination. P-1</li> </ol> <p>Y. Drum Brakes</p> <ol style="list-style-type: none"> <li>1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-1</li> <li>2. Refinish brake drum and measure final drum diameter; compare with specification. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1</p> <p>4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2</p> <p>5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-</p> <p>Z. Disc Brakes</p> <p>1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1</p> <p>2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.</p> <p>3. Remove and inspect, and/or replace brake pads and retaining hardware; determine necessary action. P-1</p> <p>4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks. P-1</p> <p>5. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1</p> <p>6. Remove and reinstall/replace rotor. P-1</p> <p>7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-1</p>
6303	Power Equipment Technology 4	<p>K. Electrical Systems Service</p> <p>8. Remove and replace starter solenoid.</p> <p>9. Remove and replace ignition switch.</p> <p>L. Drive Systems</p> <p>6. Change fluid in a hydrostatic transmission.</p> <p>7. Repair a manual transmission.</p> <p>8. Repair a differential.</p>

Course Code	Course Name	Essential Standards
		<p>P. Manual Drive Train: Transmission/Transaxle</p> <ol style="list-style-type: none"> <li>1. Describe the operational characteristics of an electronically controlled manual transmission/transaxle. P-2</li> </ol> <p>T. Related Suspension and Steering Service Diagnosis and Repair</p> <ol style="list-style-type: none"> <li>1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-1</li> <li>2. Inspect power steering fluid level and condition. P-1</li> <li>3. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification. P-2</li> <li>4. Inspect for power steering fluid leakage. P-1</li> <li>5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1</li> <li>6. Inspect and replace power steering hoses and fittings. P-2</li> <li>7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-1</li> <li>8. Inspect tie rod ends (sockets), tie rod sleeves, and clamps. P-1</li> <li>9. Inspect upper and lower control arms, bushings, and shafts. P-1</li> <li>10. Inspect and replace rebound bumpers. P-1</li> <li>11. Inspect track bar, strut rods/radius arms, and related mounts and bushings. P-1</li> <li>12. Inspect upper and lower ball joints (with or without wear indicators). P-1</li> <li>13. Inspect suspension system coil springs and spring insulators (silencers). P-1</li> <li>14. Inspect suspension system torsion bars and mounts. P-1</li> <li>15. Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-1</li> <li>16. Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings. P-2</li> <li>17. Inspect front strut bearing and mount. P-1</li> <li>18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. P-1</li> <li>19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1</li> <li>20. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1</li> </ol> <p>Inspect electric power steering assist system. P-2</p>

Course Code	Course Name	Essential Standards
		<p>22 Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2</p> <p>23 Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control). P-3</p> <p>Z. Disc Brakes</p> <p>8. Retract and re-adjust caliper piston on an integrated parking brake system. P-2 9. Check brake pad wear indicator; determine needed action. P-1 10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1</p> <p>AA. BRAKES: POWER-ASSIST UNITS</p> <p>1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2 2. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1</p> <p>BB. Brakes: Related Systems (I.E. Wheel Bearings, Parking Brakes, Electrical)</p> <p>1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1 2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replaced as needed. P-2 3. Check parking brake operation and parking brake indicator light system operation; determine needed action. P-1 4. Check operation of brake stop light system. P-1 5. Replace wheel bearing and race. P-2 Inspect and replace wheel studs. P-1</p>

Course Code	Course Name	Essential Standards
		<p>CC. Brakes: Electronic Brake, Traction Control (Tcs), Stability Control (Esc) Systems</p> <ol style="list-style-type: none"> <li>1. Identify traction control/vehicle stability control system components. P-3</li> <li>2. Describe the operation of a regenerative braking system. P-3</li> </ol> <p>DD. General Electrical/Electronic Systems</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1</li> <li>3. Use wiring diagrams to trace electrical/electronic circuits. P-1</li> <li>4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1</li> <li>5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1</li> <li>6. Use a test light to check operation of electrical circuits. P-2</li> <li>7. Use fused jumper wires to check operation of electrical circuits. P-2</li> <li>8. Measure key-off battery drain (parasitic draw). P-1</li> <li>9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1</li> <li>10. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair) P-1</li> <li>11. Identify electrical/electronic system components and configuration. P-1</li> </ol> <p>EE. Electrical/Electronic Systems: Battery Service</p> <ol style="list-style-type: none"> <li>1. Perform battery state-of-charge test; determine necessary action. P-1</li> <li>2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action. P-1</li> <li>3. Maintain or restore electronic memory functions. P-1</li> <li>4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1</li> </ol>

Course Code	Course Name	Essential Standards
		<p>5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1</p> <p>6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1</p> <p>7. Identify safety precautions for high voltage systems on electric, hybrid-electric, and diesel vehicles. P-2</p> <p>8. Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery. P-1</p> <p>9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-2</p> <p>FF. Electrical/Electronic Systems: Starting System</p> <p>1. Perform starter current draw test; determine necessary action. P-1</p> <p>2. Perform starter circuit voltage drop tests; determine necessary action. P-1</p> <p>3. Inspect and test starter relays and solenoids; determine necessary action. P-2</p> <p>4. Remove and install starter in a vehicle. P-1</p> <p>5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2</p> <p>6. Demonstrate knowledge of an automatic idle-stop/start-stop system. P-</p> <p>GG. Electrical/Electronic Systems: Charging System</p> <p>1. Perform charging system output test; determine necessary action. P-1</p> <p>2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1</p> <p>3. Remove, inspect, and/or replace generator (alternator). P-2</p> <p>4. Perform charging circuit voltage drop tests; determine necessary action. P-2</p> <p>HH. Electrical/Electronic Systems: Lighting, Instrument Cluster, Driver Information, And Body Electrical Systems</p> <p>1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1</p> <p>2. Aim headlights. P-2</p>

Course Code	Course Name	Essential Standards
		<p>3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2</p> <p>4. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-2</p> <p>5. Remove and reinstall door panel. P-1</p> <p>6. Describe the operation of keyless entry/remote-start systems. P-3</p> <p>7. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1</p> <p>8. Verify windshield wiper and washer operation; replace wiper blades. P-1</p> <p>II. General Heating, Ventilation, and Air Conditioning (HVAC)</p> <p>1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1</p> <p>2. Identify heating, ventilation and air conditioning (HVAC) components and configuration. P-1</p> <p>JJ. HVAC: Refrigeration System Components</p> <p>1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary action. P-1</p> <p>2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. P-2</p> <p>3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-</p> <p>KK. Heating, Ventilation, and Engine Cooling Systems</p> <p>1. Inspect engine cooling and heater systems hoses and pipes; determine necessary action. P-1</p> <p>LL. HVAC: Operating Systems and Related Controls</p> <p>1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action.</p> <p>2. Identify the source of A/C system odors</p>

Course Code	Course Name	Essential Standards
		<p>MM. General Engine Performance</p> <ol style="list-style-type: none"> <li>1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1</li> <li>2. Perform engine absolute manifold pressure tests (vacuum/boost); document results. P-2</li> <li>3. Perform cylinder power balance test; document results. P-2</li> <li>4. Perform cylinder cranking and running compression tests; document results. P-2</li> <li>5. Perform cylinder leakage test; document results. P-2</li> <li>6. Verify engine operating temperature. P-1</li> <li>7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1</li> </ol> <p>NN. Computerized Controls</p> <ol style="list-style-type: none"> <li>1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1</li> <li>2. Describe the use of the OBD monitors for repair verification. P-1</li> </ol> <p>OO. Fuel, Air Induction, and Exhaust Systems</p> <ol style="list-style-type: none"> <li>1. Replace fuel filter(s) where applicable. P-2</li> <li>2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1</li> <li>3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1</li> <li>4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action. P-1</li> <li>5. Check and refill diesel exhaust fluid (DEF). P-2</li> </ol> <p>PP. Emissions Control Systems</p> <ol style="list-style-type: none"> <li>1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action. P-2</li> </ol>

Course Code	Course Name	Essential Standards
<b>Global Logistics &amp; Supply Chain Management</b>		
6191	Introduction to Logistics	To receive course standards for all SREB Advanced Career curriculums visit the web site - <a href="http://www.sreb.org">www.sreb.org</a>
6192	Functional Areas in Logistics	
6193	Global Logistics Management	
6194	Logistics and Supply Chain Management	