Arkansas Department of Career Education
Model Framework

Course Title: **Engine Performance**

Career Cluster: **Transportation, Distribution & Logistics**

Secondary – Skilled and Technical Sciences		
Course Number	494200	
CIP Number	47.0604 ***http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55***)	
Grade Level	9-12	
Prerequisite	None	
Course Type	Elective	
Teacher Certification	Technical Permit	
CTSO	Support Course	Support Course
Facility Requirements	http://arkansasfacilities.arkansas.gov/SchoolFacManual.aspx	
Industry Certifications	www.NATEF.org	

Course Description
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Program Purpose/Structure
The curriculum content framework Automotive Service Technology supports the course that prepares students for the following career roles, which in turn correspond to the CIP (Classification of Instructional Programs) codes listed above. The courses may be sequenced with a variety of career and technical courses to form a specialization to prepare students for careers and support additional education and training in the protective services industry.
The Transportation cluster of programs prepares students for careers in automotive service and repair, aviation maintenance, diesel equipment maintenance and repair, and small engine repair. Programs within the Transportation cluster are listed as follows:
Automotive Body Technology — Certified

Automotive Service Technology — Certified
Aviation Maintenance Technology
Diesel Equipment Technology
Power Equipment Technology
Career Role CIP Code – 47.0604
O-NET 49-3023.XX

Laboratory Activities

Special Notes

Career and Technical Student Organization (CTSO)
SkillsUSA

Arkansas Department of Career Education
Engine Performance Student Performance Standards

Course Title: Electrical Systems

Course Code: 494200

Credit: 1

At the completion of this course, the student will be able to:

1.0 Identify and Demonstrate Workplace Safety
- 1.1 Students will be able to identify and demonstrate safe work practices
- 1.2 Students will be able to practice personal safety

2.0 Demonstrate proper usage of Tools and Equipment
- 2.1 Student will demonstrate knowledge of shop tools and equipment

3.0 Develop Employability/Leadership Skills
- 3.1 Student will demonstrate employability skills
- 3.2 Student will demonstrate leadership skills

4.0 Diagnose and Repair Engine Performance
- 4.1 Student will demonstrate initial diagnostic and repair of Engine Performance procedures
- 4.2 Student will demonstrate applicable knowledge of Computerized Engine Controls

5.0 Diagnose and Repair Fuel, Air Induction, and Exhaust System
- 5.1 Student will demonstrate initial diagnostic procedures

6.0 Diagnose and Repair Emissions Control Systems
- 6.1 Student will demonstrate initial diagnostic and repair procedures for Emissions Control Systems

7.0 Diagnose and Repair General Engine
- 7.1 Student will demonstrate initial engine repair diagnostic procedures
- 7.2 Student will demonstrate ability to repair Cylinder Head and Valve Train
- 7.3 Student will demonstrate ability to repair Lubrication and Cooling Systems

8.0 Prepare Vehicle for Service
- 8.1 Student will be able to prepare vehicle for service
- 8.2 Student will be able to prepare vehicle for customer

Standard 1.0 Identify and Demonstrate Workplace Safety			
Performance Indicator 1.1 **Students will be able to identify and demonstrate safe work practices.**	• **Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
1.1.1 Identify general shop safety rules and procedures.	• Review and assess understanding of posted shop regulations. • (Teacher will post standard expectations of safe shop practices)	L11-12.4	CRP1
1.1.2 Utilize safe procedures for handling of tools and equipment.	• Have students demonstrate proficiency with tools and equipment before performing tasks with them.	L11-12.4	CRP2
1.1.3 Identify and use proper placement of floor jacks and jack stands.	• Research service information for proper procedure. • Demonstrate proficiency in using floor jacks and jack stands before lifting vehicle.	R11-12.1	CRP11
1.1.4 Identify and use proper procedures for safe lift operation.	• Locate and understand lift manufacturer safety information on lift tag. • Refer to service manual for proper lifting points. • Demonstrate proficiency operating lift.	L11-12.4	CRP11
1.1.5 Utilize proper ventilation procedures for working within the lab/shop area.	• Locate and identify ventilation system for shop. • Identify and demonstrate proper use of ventilation procedure. • Have students write paragraph on dangers of asphyxiation.	W11-12.2	CRP3
1.1.6 Identify marked safety areas.	• Locate and identify different marked areas in shop. • Demonstrate understanding of purpose of marked areas. • Have students draw diagram of marked areas in the shop.	Sl11-12.5	CRP2 CRP3
1.1.7 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	• Have student identify and locate fire extinguishers in shop. • Pass a fire safety test. • Have students review evacuation plan and where it is located in the building.	SL11-12.2	CRP3
Performance Indicator 1.2 **Students will be able to practice personal safety.**	• **Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**

1.2.1 Identify the location and use of eye wash stations.	• Pass a safety procedure test. • Have students label eye station on diagram of shop.	SL11-12.2	CRP3
1.2.2 Identify the location of the posted evacuation routes.	• Pass a safety procedure test. • Have students label location of evacuation route on diagram of shop.	SL11-12.2	CRP3
1.2.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	• Demonstrate the proper usage of personal protective equipment (PPE). • (Teacher will post rules posted including consequences of noncompliance). • https://www.osha.gov/OshDoc/data_General_Facts/ppe-factsheet.pdf	SL11-12.2 R11-12.7	CRP3 TD5
1.2.4 Identify and wear appropriate clothing for lab/shop activities.	• Students will demonstrate appropriate dress before working in shop. • (Teacher will post rules posted and logical consequences for noncompliance).	SL11-12.2 R11-12.7	CRP3
1.2.5 Secure hair and jewelry for lab/shop activities.	• Identify hair and jewelry hazards. • Have students find safety violation with other students.	SL11-12.2 R11-12.7	CRP3 CRP4
1.2.6 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	• Identify areas of possible danger, show video or demonstrate air bag deployment. • (Teacher will emphasize the importance of correctly identifying the yellow and orange circuits).	SL11-12.2 R11-12.7 R11-12.6	CRP3 CRP5 CRP11
1.2.7 Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	• Identify areas of possible danger. • Have a live demonstration of a volunteer being tazed by security office so they will understand the shock hazard.	SL11-121d	CRP1 CRP12
1.2.8 Locate and demonstrate knowledge of material safety data sheets (MSDS).	• Location of MSDS included in safety test. • Have students identify chemicals and pull up and print MSDS sheets on chemicals in the lab area. • http://www.msds.com/	R11-12.3	CRP11 CRP7

Standard 2.0 Demonstrate proper usage of Tools and Equipment			
Performance Indicator 2.1 **Student will demonstrate knowledge of shop tools and equipment.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
2.1.1 Identify tools and their usage in automotive applications.	• Tool identification exercises, including hand outs and spot quizzes.	R11-12.4	TD2
2.1.2 Identify standard and metric designation.	• Review and identify common tool sizes utilizing textbook, handouts and enrichment exercises. • http://www.cdxetextbook.com/toolsEquip/hpt/common/title.html	R11-12.4 L11-12.6	TD2
2.1.3 Demonstrate safe handling and use of appropriate tools.	• Demonstrate proficiency. • Have students identify the proper application of tools by setting up a scenario for students to describe which tool is used where.	R11-12.4 L11-12.6	CRP1 CRP3
2.1.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	• Demonstrate proficiency. • (Teacher review policies regarding tool disbursement and storage). • Have students clean and store tools according to school policy.	R11-12.4 L11-12.6	CRP12
2.1.5 Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).	• Demonstrate proficiency in measuring brake rotors, drums, thickness, parallelism, and run-out. • Have students' measure items with different types of tools.	R11-12.4 L11-12.6	CRP2 CRP4

Tools:

http://www.onguardsafetytraining.com/samples/2Automotive%20Hand%20tools.pdf

SAE/Metric:

http://www.sosmath.com/tables/sae/sae.html

http://www.hondachopper.com/garage/sae_to_metric/SAE-Metric_Conversion_Chart.pdf

http://www.engineeringtoolbox.com/wrenches-inches-metric-us-conversion-comparison-d_1607.html

Standard 3.0 Develop Employability/Leadership Skills			
Performance Indicator 3.1 **Student will demonstrate employability skills.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
3.1.1 Demonstrate a good work ethic (i.e., relations with other, dependability, attitude, and personal hygiene).	• Use guest speakers from industry. • Utilize career coaches to model appropriate behavior and attitude.	SL11-12.1	TD1 CRP1
3.1.2 Demonstrate teamwork.	• Utilize team building activities. • Assign paired work. • Place students in work groups with rotating roles.	SL11-12.1b	CRP1 CRP12
3.1.3 Demonstrate job-seeking techniques (i.e., write a resume, search for a job, arrange references, and apply interview techniques)	• Prepare resume. Perform mock interview. • Have career coach assist in resume building. • Complete a job application.	W11-12.5 W11-12.6	CRP10
3.1.4 Describe legal issues of sexual harassment in the workplace.	• Sexual harassment seminar. • Invite guest speakers.	SL11-12.3	CRP5
3.1.5 Identify employment eligibility requirements (e.g. valid driver's license, background check etc.)	• Guest speaker for job requirements. • Review job opening requirements.	SL11-12.3	TD5
Performance Indicator 3.2 **Student will demonstrate leadership skills.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
3.2.1 Perform basic parliamentary procedures in a group meeting.	• Have class meetings. Following Robert Rules of Order.	SL11-12.1b	CRP9
3.2.2 Demonstrate an understanding of one's personal values, interpersonal skills, etiquette, effectiveness in oral and written communication and courtesy. Develop and maintain a code of professional ethics.	• Perform self-evaluation. • Use a professional development manual. • Practice communication exercises. • Practice writing examples, role-play conflict resolution scenarios. • Utilize appropriate CTSO resources.	SL11-12.1b	CRP4 CRP9
3.2.3 Maintain a good professional	• Teacher will counsel students on importance of maintaining a	SL11-12.3	CRP3

appearance.	positive image. • Invite industry representatives to discuss standards.		
3.2.4 Perform basic tasks related to securing and terminating employees.	• Perform mock interviews. • Evaluate employee performance and simulate terminations.	SL11-12.3	CRP9 TD5

Standard 4.0 Diagnose and Repair Engine Performance			
Performance Indicator 4.1 Student will demonstrate initial diagnostic and repair of Engine Performance procedures.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
4.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	• Use on-line service information or service manual to obtain the required information.	SL11-12.1a SL11-12.5	CRP11 TD-MTN1
4.1.2 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	• Use an absolute pressure gauge hooked up to a vacuum port from intake/plentium. • Compare reading to acceptable range in service information source and determine next action.	R11-12.3	CRP2
4.1.3 Perform cylinder power balance test; determine necessary action.	• Using available service information for reference, with the vehicle running at normal temperature, use engine analyzer or scan tool. • Determine weak cylinder or cylinders and take appropriate action.	R11-12.3 R11-12.4	CRP2 CRP11 CRP4
4.1.4 Perform cylinder cranking and running compression tests; determine necessary action.	• Using available service information for reference, disable fuel to engine and remove all spark plugs. • Compare to know good cylinder and if more than a 15 percent differential exists then determine necessary action.	R11-12.3 R11-12.4	CRP2 CRP11 CRP4
4.1.5 Perform cylinder leakage test; determine necessary action.	• Using available service information for reference, use approved cylinder leak down tester to test cylinder through sparkplug hole.	R11-12.3	CRP2 CRP11
4.1.6 Verify engine operating temperature.	• Use infrared temperature probe to read engine temperature. A	R11-12.3	CRP2

	water temperature gauge may be hooked up to a water port and the gauge can be read.	R11-12.4	CRP11 CRP4
4.1.7 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	• Remove spark plug boot and then remove spark plug and inspect for wear and color. • Remove distributor cap and inspect for wear and cracks. • Remove rotor and inspect for wear and carbon build up. • Replace worn or defective parts.	R11-12.3 R11-12.4	CRP2 CRP11 CRP4
Performance Indicator 4.2 Student will demonstrate applicable knowledge of Computerized Engine Controls.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
4.2.1 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	• Using scan tool retrieve diagnostic trouble codes (DTC) and use code to investigate the faulty component. • Clear code when repaired.	SL11-12.1a SL11-12.5 R11-12.4	CRP11 TD-MTN1
4.2.2. Describe the importance of operating all OBDII monitors for repair verification.	• Doing a complete drive cycle will ensure a complete check of all OBD 2 monitors.	R11-12.4	CRP2 CRP8 CRP11

Standard 5.0 Diagnose and Repair Fuel, Air Induction, and Exhaust System			
Performance Indicator 5.1 Student will demonstrate initial diagnostic procedures.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
5.1.1 Replace fuel filter(s).	• Have students' look-up and discuss the change interval of the fuel filter on their vehicle and the advantages and disadvantages of performing this service. • Change the fuel filter on a vehicle.	R11-12.1 SL11-12.1 L11-12.4	CRP2 CRP11 CRP4
5.1.2 Inspect, service, or replace air filters, filter housings, and intake duct work.	• Have student look-up and discuss the change interval of the air filter on their vehicle and compare the advantages and disadvantages of performing this service then have them change the air filter on a vehicle.	R11-12.1 SL11-12.1 L11-12.4	CRP2 CRP11 CRP4
5.1.3 Inspect integrity of the exhaust	• Have student inspect all components in exhaust system.	R11-12.1	CRP2

manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.	• Look for rust, holes, or breaks in the system and replace as needed.	R11-12.3	
5.1.4 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.	• Have student inspect exhaust hangars for broken or torn rubber in hanger. • Check for rusted or broken pieces.	R11-12.1	CRP2
5.1.5 Check and refill diesel exhaust fluid (DEF).	• Have student find (DEF) fluid holding tank and visually check fluid level and fill to correct level.	R11-12.1	CRP2

Standard 6.0 Diagnose and Repair Emissions Control Systems			
Performance Indicator 6.1 Student will demonstrate initial diagnostic and repair procedures for Emissions Control Systems.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
6.1.1 Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	• Have student look-up and discuss change interval of (PCV) filter on vehicle. • Inspect and test (PCV) filter and clean or replace as needed.	R11-12.3 R11-12.4 L11-12.4	CRP2 CRP11 CRP4

Standard 7.0 Diagnose and Repair General Engine			
Performance Indicator 7.1 Student will demonstrate initial engine repair diagnostic procedures.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
7.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	• Have student use on-line vehicle service information or service manual to check for (TSB's) and service procedure precautions. • Interview customer or check vehicle for service records.	• SL11-12.1a • SL11-12.5	• CRP11 • TD-MTN1
7.1.2 Verify operation of the instrument panel engine warning indicators.	• Have student cycle key to run position and check all warning lights and indicators for proper operation.	• R11-12.4	• CRP11 • TD-MTN1

7.1.3 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	• Perform visual inspection. • Add engine oil dye and coolant dye to the vehicle and complete a drive cycle to determine if there are any leaks in those systems.	• R11-12.1 •	• CRP2 • CRP7 • CRP6
7.1.4 Install engine covers using gaskets, seals, and sealers as required.	• Have student remove valve cover and inspect for imperfections in gaskets that could cause leaks. • Have student clean and replace cover with new gasket and reinstall covers to proper torque specs.	• R11-12.1 •	• CRP2 • CRP7 •
7.1.5 Remove and replace timing belt; verify correct camshaft timing.	• Have student look-up service information using service manual or on-line service to obtain service procedure to change timing belt. • Before the student reinstalls the timing cover have instructor verify proper camshaft timing.	• R11-12.3 • R11-12.4	• CRP2 • CRP11 •
7.1.6 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	• Have student use a thread file on a smashed bolt to repair damaged threads. • Have student repair damaged spark plug threads in head using a drill and thread insert.	• R11-12.1 •	• CRP2 • CRP7 •
7.1.7 Identify hybrid vehicle internal combustion engine service precautions.	• Have student look-up service precautions and technical service bulletins (TSB's) on a Hybrid vehicle.	• R11-12.3 • R11-12.4	• CRP2 • CRP11 • CRP4
Performance Indicator 7.2 Student will demonstrate ability to repair Cylinder Head and Valve Train.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
7.2.1 Adjust valves (mechanical or hydraulic lifters).	• Have student look-up service information on proper technique and torque specs / valve lash for valve adjustments. • Have students adjust valves and verify repair.	Click here to enter text.	Click here to enter text.
Performance Indicator 7.3 Student will demonstrate ability to repair Lubrication and Cooling Systems.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
7.3.1 Perform cooling system pressure and dye tests to identify leaks; check coolant	• Have student look-up service information for recommended fluid levels for the vehicle.	R11-12.3 R11-12.4	CRP2 CRP11

condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action.	• Check pressures and inspect for dye to find leaks. • Determine necessary actions.		CRP4
7.3.2 Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	• Have student remove drive belts and inspect for wear and cracks. • Check tensioners and pulleys for wear and cracks. • Replace as needed. • After repair is complete check work with a belt tension gauge.	R11-12.3	CRP2 CRP7
7.3.3 Remove, inspect, and replace thermostat and gasket/seal.	• Have student remove thermostat housing and thermostat, inspect for wear and damage. • Clean mounting surface and housing, install new thermostat and gasket / seal, and check for leaks.	R11-12.3	CRP2 CRP7
7.3.4 Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	• Have student look-up service information for recommended fluid levels for the vehicle. • Have student hook-up coolant recovery machine and perform flush service, then refill with new coolant mixture to recommended level. • Bleed system and run vehicle to verify repair.	R11-12.3 R11-12.4	CRP2 CRP11
7.3.5 Perform engine oil and filter change.	• Have student look-up service information for the vehicle. • Raise vehicle on lift, remove drain plug and drain oil. • Remove filter and install new filter. • Replace drain plug, lower vehicle and add oil to recommended level.	R11-12.3 R11-12.4	CRP2 CRP11

Standard 8.0 Prepare Vehicle for Service			
Performance Indicator 8.1 **Student will be able to prepare vehicle for service.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
8.1.1 Identify information needed and the service requested on a repair order.	• Have students write and print repair orders. • Have students explain information on repair orders.	SL11-12.1a SL11-12.5 W11-12.8	CRP11

8.1.2 Identify purpose and demonstrate proper use of fender covers, mats.	• Have established policy of using covers and mats. • Have students rotate as service writer and have them install mats and covers.	R11-12.2 W11-12.8	CRP2
8.1.3 Demonstrate use of the three C's (concern, cause, and correction).	• Have students list 3 c's on every work order.	SL11-12.1b W11-12.8	CRP2
8.1.4 Review vehicle service history.	• Review available service records. • (Teacher led discussion on previous repairs and effect on current problem).	SL11-12.5	CRP2
8.1.5 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	• Have students fill out work order on every vehicle. • Train student on writing and filling out repair orders.	W11-12.2	CRP11 CRP4
Performance Indicator 8.2 **Student will be able to prepare vehicle for customer.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
8.2.1 Ensure vehicle is prepared to return to customer per school or company policy (floor mats, steering wheel cover, etc.).	• (Teacher to have established policy of what is done to a vehicle before it is returned to customer). • Clean of grease marks or stains etc. • Car is fixed according to work order.	R11-12.2 R11-12.9	CRP11 CRP2

Common Core State Standards Grades 9-12

ELA Speaking and Listening Standards Grades 9-10

1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL9-10.1**
    a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. **SL9-10.1a**
    b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. **SL9-10.1b**
    c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. **SL9-10.1c**
    d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. **SL9-10.1d**
2. Integrate multiple sources of information presented in diverse media or format(e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. **SL9-10.2**
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. **SL9-10.3**
4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. **SL9-10.4**
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL9-10.5**

ELA Speaking and Listening Standards Grades 11-12

1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL11-12.1**
    a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. **SL11-12.1a**
    b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. **SL11-12.1b**

c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. **SL11-12.1c**
d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. **SL11-12.1d**

2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL11-12.2**
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. **SL11-12.3**
4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. **SL11-12.4**
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL11-12.5**

ELA Language Grades 9-10

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies. **L9-10.4**
   a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. **L9-10.4a**
   b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy). **L9-10.4b**
   c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. **L9-10.4c**
   d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). **L9-10.4d**
6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. **L9-10.6**

ELA Language Grades 11-12

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies. **L11-12.4**

a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. **L11-12.4a**
b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable). **L11-12.4b**
c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. **L11-12.4c**
d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary **L11-12.4d**

6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. **L11-12.6**

Reading Standards for Literacy in Science and Technical Subjects Grades 9-10

1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **R9-10.1**
2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. **R9-10.2**
3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **R9-10.3**
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. **R9-10.4**
5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). **R9-10.5**
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. **R9-10.6**
7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **R9-10.7**
8. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **R9-10.8**
9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **R9-10.9**
10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. **R9-10.10**

Reading Standards for Literacy in Science and Technical Subjects Grades 11-12

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **R11-12.1**
2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **R11-12.2**
3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **R11-12.3**
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. **R11-12.4**
5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **R11-12.5**
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **R11-12.6**
7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **R11-12.7**
8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **R11-12.8**
9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **R11-12.9**
10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. **R11-12.10**

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects Grades 9-10

1. Write arguments focused on discipline-specific content. **W9-10.1**
    a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. **W9-10.1a**
    b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. **W9-10.1b**
    c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. **W9-10.1c**
    d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W9-10.1d**
    e. Provide a concluding statement or section that follows from or supports the argument presented. **W9-10.1e**
2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **W9-10.2**

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **W9-10.2a**
b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **W9-10.2b**
c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. **W9-10.2c**
d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. **W9-10.2d**
e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W9-10.2e**
f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). **W9-10.2f**

3. Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. **W9-10.3**
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W9-10.4
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. **W9-10.5**
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. **W9-10.6**
7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **W9-10.7**
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. **W9-10.8**
9. Draw evidence from informational texts to support analysis, reflection, and research. **W9-10.9**
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. **W9-10.10**

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects Grades 11-12

1. Write arguments focused on discipline-specific content. **W11-12.1**

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. **W11-12.1a**
b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. **W11-12.1b**
c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. **W11-12.1c**
d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W11-12.1d**
e. Provide a concluding statement or section that follows from or supports the argument presented. **W11-12.1e**

2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **W11-12.2**
   a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **W11-12.2a**
   b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **W11-12.2b**
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. **W11-12.2c**
   d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. **W11-12.2d**
   e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). **W11-12.2e**
3. Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. **W11-12.3**
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
   W11-12.4
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. **W11-12.5**
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. **W11-12.6**

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **W11-12.7**
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **W11-12.8**
9. Draw evidence from informational texts to support analysis, reflection, and research. **W11-12.9**
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. **W11-12.10**

Common Career and Technical Core Standards

Transportation, Distribution, & Logistics Career Cluster

Transportation, Distribution, & Logistics Career Cluster Standards (TD)

1. Describe the nature and scope of the Transportation, Distribution, and Logistics Career Cluster and the role of transportation, distribution and logistics in society and the economy. **TD1**
2. Describe the application and use of new and emerging advanced techniques to provide solutions for transportation, distribution, and logistics problems. **TD2**
3. Describe key operational activities required of successful transportation, distribution, and logistics facilities. **TD3**
4. Identify governmental policies and procedures for transportation, distribution, and logistics facilities. **TD4**
5. Describe transportation, distribution, and logistics employee rights and responsibilities and employers' obligations concerning occupational safety and health. **TD5**
6. Describe career opportunities and means to achieve those opportunities in each of the Transportation, Distribution, and Logistics Career Pathways. **TD6**

Facility and Mobile Equipment Maintenance Career Pathway (TD-MTN)

1. Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation. **TD-MTN1**
2. Design ways to improve facility and equipment system performance. **TD-MTN2**

Common Career and Technical Core Career Ready Practices (CCTC CRP)

1. Act as a responsible and contributing citizen and employee. **CRP1**

2. Apply appropriate academic and technical skills. **CRP2**
3. Attend to personal health and financial well-being. **CRP3**
4. Communicate clearly, effectively, and with reason. **CRP4**
5. Consider the environmental, social and economic impacts of decisions. **CRP5**
6. Demonstrate creativity and innovation. **CRP6**
7. Employ valid and reliable research strategies. **CRP7**
8. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP8**
9. Model integrity, ethical leadership, and effective management. **CRP9**
10. Plan education and career path aligned to personal goals.**CRP10**
11. Use technology to enhance productivity. **CRP11**
12. Work productively in teams while using cultural/global competence. **CRP12**