

Department of College and Career Readiness

Automotive III

5.0 Credits



Unit Two

Automotive III

Course Description

This course will introduce students to the operational and automotive component systems focusing on the power-plant and transmission. Specifically but not restricted to fuel, intake, exhaust, ignition and automatic and manual transmission systems. Practical application of safe work habits and the correct use of tools and precision test instruments will be throughout the course. In addition, to meet the needs of changing technology, this program offers students the opportunity to master the necessary skills to pass the Automotive Service Excellence Certification (ASE) examination.

Automotive III

Pacing Guide		
Unit	Topic	Suggested Timing
Unit 1	Automotive Electronics	approx. 9 weeks
Unit 2	Automotive Heating and Cooling	approx. 9 weeks
Unit 3	Automotive Advanced Engine Repair I	approx. 8 weeks
Unit 4	Automotive Advanced Engine Repair II	approx. 9 weeks

Educational Technology Standards

8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.E.1, 8.1.12.F.1

- **Technology Operations and Concepts**
 - Create a personal digital portfolio, which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
- **Creativity and Innovation**
 - Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
- **Communication and Collaboration**
 - Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
- **Digital Citizenship**
 - Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
- **Research and Information Literacy**
 - Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
- **Critical Thinking, Problem Solving, Decision Making**
 - Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

CRP1. Act as a responsible and contributing citizen and employee

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2. Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP3. Attend to personal health and financial well-being.

Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

CRP4. Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP5. Consider the environmental, social and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP6. Demonstrate creativity and innovation.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP9. Model integrity, ethical leadership and effective management.

Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP10. Plan education and career paths aligned to personal goals.

Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP11. Use technology to enhance productivity.

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Differentiated Instruction

Strategies to Accommodate Students Based on Individual Needs

<u>Time/General</u>	<u>Processing</u>	<u>Comprehension</u>	<u>Recall</u>
<ul style="list-style-type: none"> • Extra time for assigned tasks • Adjust length of assignment • Timeline with due dates for projects • Communication system between home and school • Provide notes/outline 	<ul style="list-style-type: none"> • Extra Response time • Have students verbalize steps • Repeat, clarify or reword directions • Mini-breaks between tasks • Provide a warning for transitions • Work partners 	<ul style="list-style-type: none"> • Precise step-by-step directions • Short manageable tasks • Brief and concrete directions • Provide immediate feedback • Small group instruction • Emphasize multi-sensory learning 	<ul style="list-style-type: none"> • Teacher-made checklist • Use visual graphic organizers • Reference resources to promote independence • Visual and verbal reminders • Graphic organizers
<u>Assistive Technology</u>	<u>Tests/Quizzes/Grading</u>	<u>Behavior/Attention</u>	<u>Organization</u>
<ul style="list-style-type: none"> • Computer/whiteboard • Audio Recorder • Spell-checker • Audio-taped books 	<ul style="list-style-type: none"> • Extended time • Study guides • Shortened tests • Read directions aloud 	<ul style="list-style-type: none"> • Consistent daily structured routine • Simple and clear classroom rules • Frequent feedback 	<ul style="list-style-type: none"> • Individual daily planner • Display a written agenda • Note-taking assistance • Color code activities

Enrichment

Strategies Used to Accommodate Based on Students Individual Needs:

- Adaption of Material and Requirements
- Evaluate Vocabulary
- Elevated Activity Complexity
- Additional Projects
- Independent Student Options
- Projects completed individual or with Partners
- Self Selection of Project
- Tiered/Multilevel Projects
- Learning Centers
- Individual Response Blog
- Independent Studies of Manuals
- Open-ended Projects
- Community/Subject expert mentorships

Assessments

Suggested Formative/Summative Classroom Assessments

- Graphic Organizers
- Teacher-created Unit Assessments, Chapter Assessments, Quizzes
- Systematic Skills assessment
- Accountable Talk, Oral Report, Think Pair, and Share
- Projects, Portfolio,
- Homework
- Schematic Mapping
- Photo, Video problem solving analysis
- NATEF task sheets
- NATEF end of program exams

Interdisciplinary Connections

English Language Arts

- Journal writing
- Close reading of Automotive-related content
- Create a brochure for a Auto industry
- Keep a running word wall of Automotive vocabulary

Social Studies

- Research the history of a given Automotive Industry
- Research prominent historical individuals in Automotive Industry
- Use historical references to solve problems

World Language

- Translate Automotive/Transportation-content
- Create a translated index of Automotive vocabulary
- Generate a translated list of words and phrases related to workplace safety

Math

- Research Automotive occupation salaries for a geographic area and juxtapose against local cost of living
- Go on a geometry scavenger hunt within Automotive repair shop
- Track various data, such as Transportation's impact on the GDP, career opportunities or among individuals currently occupying Automotive careers

Fine & Performing Arts

- Create a poster advertising your Automotive Repair Shop
- Design a flag or logo to represent your shop

Science

- Research the environmental impact of Automotive industry
- Research latest developments in automotive technology
- Investigate automotive applicable-careers in STEM fields

New Jersey Student Learning Standards

9.3– Career and Technical Education

TRANSPORTATION, DISTRIBUTION & LOGISTICS CAREER CLUSTER

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

Pathway: FACILITY & MOBILE EQUIPMENT MAINTENANCE (TD□MTN)/ TRANSPORTATION OPERATIONS (TD□OPS)

- 9.3.12.TD□MTN.1: Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD□MTN.2: Design ways to improve facility and equipment system performance.
- 9.3.12.TD□OPS.1: Develop and evaluate transportation plans to move people and/or goods to meet customer requirements.
- 9.3.12.TD□OPS.2: Analyze performance of transportation operations in order to improve quality and service levels and increase efficiency.

Common Career Technical Core (CCTC)

Career Cluster Education & Training

TD 01 – Describe the nature and scope of the Transportation, Distribution & Logistics Career Cluster and the role of transportation, distribution and logistics in society and the economy.

- TD 01.3 – Identify the major modes of transportation and their role in society.

TD-MTN 1– Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.

- TD-MTN 01.1 – Develop preventive maintenance plans and systems to meet equipment manufacturer requirements.
- TD-MTN 01.2 – Apply strategies used to monitor and evaluate the performance of maintenance plans and systems.

TD-MTN 2– Design ways to improve equipment performance.

- TD-MTN 02.1 – Develop plans for improving equipment performance.
- TD-MTN 02.2 – Execute repair plans for mobile equipment.
- TD-MTN 02.3 – Develop and execute repair plans based upon an assessment of the equipment inventory.

TD-HSE 1- Describe the health, safety and environmental rules and regulations in transportation workplace.

- TD-HSE 1.1 – Conduct audits and inspections and evaluate compliance with company policies and government laws and regulations.
- TD-HSE 1.3– Manage the ongoing implementation of health, safety and environmental policies, procedures and documentation systems including development of communication plans that promote and support the effort.

Common Core State Standards (CCSS)

CCSS - English-Language Arts

Key Ideas and Details:

- CCSS.ELA-LITERACY.RST.11-12.3 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.

Craft and Structure:

- CCSS.ELA-LITERACY.RST.11-12.4 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.

Integration of Knowledge and Ideas:

- CCSS.ELA-LITERACY.RST.11-12.7 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.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-LITERACY.RST.11-12.10 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.

Common Core State Standards (CCSS)

CCSS - Mathematics

Explain volume formulas and use them to solve problems:

- CCSS.MATH.CONTENT.HSG.GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder.
- CCSS.MATH.CONTENT.HSG.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Apply geometric concepts in modeling situations:

- CCSS.MATH.CONTENT.HSG.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder)
- CCSS.MATH.CONTENT.HSG.MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., BTUs per cubic foot).
- CCSS.MATH.CONTENT.HSG.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost).

Reason quantitatively and use units to solve problems:

- CCSS.MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- CCSS.MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

<p>Course: Automotive III</p> <p>Unit: II– General Heating and Air Conditioning Repair</p> <p>Grade Level: 9-12</p>	<p>Unit Overview:</p> <p>This course will introduce students to the operational and diagnostic phase of the automotive component systems. Primary Heating and Air Conditioning components. In addition to maintenance and repair of these systems. Utilizing proper care in ventilation; and the handling, storage and disposal of chemicals in accordance with local, state, and federal safety and environmental regulations. Practical application of safe work habits and the correct use of tools and precision test instruments will be throughout the unit. Understanding of intermediate to advanced automotive tools; safety practices and problem solving diagnostics are the essential next step in fulfilling the training that is needed for an automotive service career.</p>
<p>New Jersey Student Learning Standards (NJSLS): 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD□OPS.2</p>	
<p>Common Career Technical Core (CCTC): TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p>	
<p>Common Core State Standards (CCSS): RST.11-12.3; RST.11-12.4; RST.11-12.7; RST.11-12.10; HSG.GMD.A.1; HSG.GMD.A.3; HSG.MG.A.1; HSG.MG.A.2; HSG.MG.A.3; HSN.Q.A.1; HSN.Q.A.3</p>	

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>Diagnose cooling components, primarily, radiator and possible malfunctions including proper maintenance.</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD□OPS.2</p> <p>CCTC: TD 01.3, TD-</p>	<p>What are the primary functions of the radiator?</p> <p>How do we properly work around them in order to assess problem?</p> <p>What are specialty tools used to assess source of radiator malfunctioning?</p>	<ul style="list-style-type: none"> ▪ Explain purpose of radiator ▪ Demonstrate safety procedures (hot pressure) ▪ Explain radiator construction and liquid flow direction ▪ Demonstrate care in handling radiator to avoid damage 	<p>Lab</p> <p>Given a vehicle with defective radiator and access to appropriate tools, equipment and service manual, remove and replace radiator. The radiator and its connecting components must not leak.</p>	<p>EPA</p> <p>Automotive Electrical Diagnosis https://www.youtube.com/watch?v=g5n8zt7shD4</p> <p>EPA</p> <p>Environmental Compliance Guide for Auto Repair Shops https://www.ericthecarguy.com/faq/solving-</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>	<p>What parts of the engine can be damaged because of radiator malfunctioning?</p>	<ul style="list-style-type: none"> ▪ Inspect for leaks ▪ Remove and replace radiator ▪ Inspect auxiliary oil coolers, engine, and transmission coolers; replace as needed 	<p>Inspection/Checklist Conduct an inspection of radiator following proper safety techniques utilizing a checklist.</p>	<p>automotive-electrical-problems OSHA Hazardous Materials https://www.osha.gov/Publications/electrical_safety.html</p>
<p>Given a typical shop repair order Inspect and pressure-test air conditioning system.</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD OPS.2</p> <p>CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>	<p>What essential information is needed on customer information form?</p> <p>How can the customer information sheet be used to diagnose suspected problems?</p> <p>What types of repair work require eye and ear protection?</p> <p>What unique equipment is necessary?</p>	<ul style="list-style-type: none"> ▪ Explain pressure-test procedures ▪ Inspect and pressure-test the system and record your findings ▪ Use proper service manual and charts to diagnose problems in the system ▪ Verify automatic and semi-automatic temperature control operation ▪ Verify proper control of airflow through ducts and vents ▪ Determine outlet air temperatures at air 	<p>Lab Exercise Given a vehicle with an air conditioning problem, necessary tools and equipment and service manual, inspect and pressure-test air conditioning system.</p> <p>Journal Write a journal entry describing diagnostic steps for assessing proper Air Conditioning operation.</p>	<p>Downloadable Auto Repair Invoice http://www.tidyforms.com/auto-repair-invoice.html</p> <p>Auto MD Diagnosing Automotive heating and cooling systems https://www.automd.com/diagnose/</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		<ul style="list-style-type: none"> ducts and condensor ▪ Verify proper evaporator housing water drain operation 		
<p>Given a vehicle, service manual, proper tools and test equipment, discharge, evacuate and charge a basic air conditioning system. Finally leak test the system</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD OPS.2</p> <p>CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>	<p>What special tools are used in charging system?</p> <p>How do we properly determine a properly charged system for effectiveness?</p> <p>What precautions are necessary when working with chemicals and charging Air Conditioning system?</p>	<ul style="list-style-type: none"> ▪ Demonstrate safety precautions ▪ Explain purpose of Refrigerant 12 ▪ Explain purpose of evacuating the system ▪ Explain dehydration ▪ Explain effects of moisture in the system ▪ Explain temperature-pressure relationship charts ▪ Demonstrate discharging, evacuating and recharging the system to manufacturer's specifications ▪ Explain purpose and methods of leak 	<p>Lab Exercise</p> <p>Given an automobile with an air conditioning system, refrigerant, necessary tools and equipment, discharge, evacuate and charge an air conditioning system to the correct pressures with the proper air temperature coming out the in-car ducts.</p> <p>Lab Exercise</p> <p>Given a vehicle, service manual, System Pressure tester, and necessary tools, test Air Conditioning System for maximum output. When completed the system should not leak.</p> <p>Science Lab/Math Lab</p>	<p>Carparts.com Auto Air Conditioning Systems at a Glance https://www.youtube.com/watch?v=zalg5VyPvjk</p> <p>AC Delco How To Recharge an Auto AC System https://www.youtube.com/watch?v=pF67GcebpmM</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		detection <ul style="list-style-type: none"> ▪ Explain use of gauge and manifold ▪ Demonstrate method of leak detection and repair, as necessary 	Utilize math formulas to develop deviations between measurements using base line manufacturer standards and scientific methods to explain relationship between evaporation and condensation.	
Develop the special skills needed for removing and replacing components in basic air conditioning systems. Including but not limited to vacuum circuits, compressors, condensers and accumulators. NJSLS: 9.3.12.TD.1, 9.3.12.TD.6, 9.3.12.TD.5, 9.3.12.TD.□ OPS.2 CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1	How do check for electronic problems using a wiring schematic to trace circuits? What dangers are present when checking Air conditioning for vacuum circuits function? What is the need for a compressor clutch components test? What is the job of the regulator? How do we replace it?	<ul style="list-style-type: none"> ▪ Demonstrate use of a wiring schematic to trace circuits ▪ Explain how the circuits function ▪ Diagnose problems in the circuits ▪ Service and repair problems in circuits ▪ Inspect, test, and replace air conditioning compressor clutch components or assembly ▪ Demonstrate use of vacuum schematic to trace vacuum circuits ▪ Explain how the 	<p>Lab Given a vehicle with a basic air conditioning system, service manuals, tools and equipment, inspect, test, remove and replace components in a basic air conditioning system.</p> <p>Video Create a video with fellow classmates outlining proper testing of Air Conditioning system.</p> <p>Inspection/Checklist Create a checklist in</p>	<p>AutoZone Car Care How to Replace an AC Compressor in your Car https://www.youtube.com/watch?v=rulXlnG2Unk</p> <p>Automotive Diagnostic and Publishing Auto HVAC Vacuum Repair https://www.youtube.com/watch?v=PsBwQogCtUQ</p>

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<p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>		<p>vacuum circuits function</p> <ul style="list-style-type: none"> ▪ Diagnose problems in the vacuum circuits ▪ Service and repair problems in the vacuum circuits 	<p>diagnosing vacuum circuits.</p>	
<p>Given circumstances of problematic HVAC systems remove and replace engine fan clutches and blower motors and compressor shaft seals</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD OPS.2</p> <p>CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1;</p>	<p>What steps are involved in assessing blower motor problems?</p> <p>What are the major components of HVAC system in automobiles?</p> <p>What is Fan clutches and where are they located in most automobiles?</p>	<ul style="list-style-type: none"> • Describe operation and function of fan clutches • Explain use of fan shroud and the horsepower advantage of fan clutches • Demonstrate removal and replacement procedures • Explain operation of blower motor • Explain removal and replacement procedures • Remove and replace blower motor 	<p>Lab Exercise Given a vehicle with a blower motor, service manuals, tools, equipment and materials, remove and replace the blower motor.</p> <p>Lab Exercise #2 Given a vehicle with a fan clutch, service manual, necessary tools and equipment, test, remove and replace the fan clutch</p> <p>Writing Exercise Outline steps in assessing fuse/circuit system functionality</p>	<p>OSHA Website https://www.osha.gov/law-regs.html</p> <p>Auto Safety Government Website http://www.autosafety.org/</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>HSN.Q.A.1; HSN.Q.A.3</p> <p>Referencing a customer work order remove and replace heater cores, control units and cables. Also service electric engine cooling fan and controls.</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD OPS.2</p> <p>CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>	<p>What are heating cores and how are they assessed for functionality?</p> <p>What are wiring schematics? How are they used in assessing damaged or faulty HVAC controls?</p> <p>What cables are part of the HVAC system and where are they located in most cars?</p>	<ul style="list-style-type: none"> ▪ Explain the function and operation of heater cores, control units and cables ▪ Describe removal and replacement procedures ▪ Demonstrate removal and replacement of heater core • Demonstrate how to properly adjust control units and cables. • Explain function and operation of electrical cooling fans and circuitry • Trace cooling fan system circuitry on a wiring schematic • Explain procedures for testing and servicing electric cooling fans • Demonstrate testing and servicing electric 	<p>Lab Given a vehicle with a heater, service manual, tools, equipment and materials, remove and replace heater core, heater and/or air conditioning control units and control cables.</p> <p>Inspection/Checklist Conduct an inspection of HVAC system, service manual and necessary tools, diagnose the problem and make necessary repairs. Upon completion the system will operate correctly.</p>	<p>Strange Electrical Car Problems Troubleshooting Dim Headlights and Other electrical problems https://www.youtube.com/watch?v=wcbMuGE3rL4</p> <p>How a Car AC System Works https://www.youtube.com/watch?v=-INZ2sRrsuo</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>After performing above repair procedures illustrate and perform proper handling, recovery and recycling of refrigerant.</p> <p>NJSLS: 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD OPS.2</p> <p>CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p> <p>CCSS: CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3</p>	<p>What essential information is needed before handling refrigerant?</p> <p>What are some specialty tools, clothing and equipment utilized in handling of refrigerant?</p> <p>What types of refrigerants are used in cars today?</p>	<p>cooling fans</p> <ul style="list-style-type: none"> ▪ Identify the components storage areas of HVAC system fluids ▪ Follow proper safety precautions for handling hazardous materials ▪ Describe operation of refrigerant handling equipment ▪ Describe and perform proper maintenance of recovery equipment as necessary replace as needed. 	<p>Lab Exercise Given a vehicle in need of air conditioning refrigerant replacement, demonstrate proper handling, recovery, and recycling of refrigerant according to manufacturer’s and EPA guidelines..</p> <p>Journal Write a journal entry describing steps in disposing of hazardous waste.</p>	<p>EPA Environmental Compliance Guide for Auto Repair Shops http://www.epa.ohio.gov/portals/41/sb/publications/AutoRepairGuide.pdf</p> <p>OSHA Occupational Noise Exposure https://www.osha.gov/SLTC/noisehearingconservation</p>

Unit 3 Vocabulary

Orifice tubes
Expansion valves
Evaporators
Regulators
Catalysts
Vacuum
Refrigerant 12
Gauge
Deviation
Component

Thermostat
Ducts
Oil coolers
Deviation
Deteriorated
High-rate discharge
Resistance
State-of-charge
OSHA
EPA

Suggested Unit Projects

Choose At Least One

Management/Organizational Exercise

Develop relationship with local Dealership cooperative mentoring/intern program.

Individual/Group Project

Develop training tools for cooling system. Example: Refine use of new cooling chemicals and effective use and disposal.

Suggested Structured Learning Experiences

Technical Institute of America

AutoCAD Training
 New York City Location
 545 8th Avenue, 4th Floor
 New York, NY 10018
http://www.tiaedu.com/AutoCAD_Training_NYC_Class_Level_1.htm

Lincoln Tech
 70 McKee Dr, Mahwah, NJ 07430
 Phone: (201) 529-1414
 Email: info@allairevillage.org
<http://www.lincolntech-usa.com/>

BMW USA Corporate Headquarters

BMW of North America, LLC
 300 Chestnut Ridge Road
 Woodcliff Lake, NJ 07675
 Phone: 1-800-831-1117
<http://www.bmwusa.com/Standard/Content/CompanyInformation/>