PATERSON PUBLIC SCHOOLS

Preparing All Children for College and Career

Department of College and Career Readiness

Automovtive III

5.0 Credits

Unit Four

PATERSON PUBLIC SCHOOLS
Preparing All Children for College and Career

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.

PATERSON PUBLIC SCHOOLS
Preparing All Children for College and Career

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

PATERSON PUBLIC SCHOOLS
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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

Time/General	Processing	Comprehension	Recall
• Extra time for assigned tasks • Adjust length of assignment • Timeline with due dates for projects • Communication system between home and school • Provide notes/outline	• Extra Response time • Have students verbalize steps • Repeat, clarify or reword directions • Mini-breaks between tasks • Provide a warning for transitions • Work partners	• Precise step-by-step directions • Short manageable tasks • Brief and concrete directions • Provide immediate feedback • Small group instruction • Emphasize multi-sensory learning	• Teacher-made checklist • Use visual graphic organizers • Reference resources to promote independence • Visual and verbal reminders • Graphic organizers
Assistive Technology	**Tests/Quizzes/Grading**	**Behavior/Attention**	**Organization**
• Computer/whiteboard • Audio Rercorder • Spell-checker • Audio-taped books	• Extended time • Study guides • Shortened tests • Read directions aloud	• Consistent daily structured routine • Simple and clear classroom rules • Frequent feedback	• 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.

Course: Automotive III **Unit:** IV– Advanced Engine Repair and Performance II **Grade Level:** 9-12	**Unit Overview:** This course will introduce students to the operational and diagnostic phase of the automotive component systems. Utilizing the latest Computerized Engine Controls Diagnostic systems students will Inspect, test, adjust, and replace advanced engine performance enhancements, such as Turbochargers, fuel injection improvements and powertrain improvements. Diesel fueled engines will also be explored. Practical application of safe work Repair and Performance I students will focus on advanced Ignition System Diagnosis and Repair. Understanding of 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.
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	
Common Career Technical Core (CCTC): TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1	
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	

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
Diagnose and Analyze engine performance of engines equipped with turbocharger. Check and adjust waste gate. If required remove and replace turbocharger. **NJSLS:** 9.3.12.TD.1, 9.3.12.TD.6,9.3.12.TD.5, 9.3.12.TD□OPS.2	What are the primary functions of the Turbocharger? What are specialty tools used to service, repair and replace Turbo? What parts of the engine can be damaged because of	▪ Explain turbocharger design and operation ▪ Explain the purpose of the turbocharger waste gate ▪ Identify the waste gate location in the exhaust system ▪ Adjust the actuator and waste gate activating rod	**Lab** Given a vehicle, necessary repair manuals, access to required tools and equipment, remove and replace turbocharger. Examine each component and record condition. Check carburetor, plenum	**Turbochargers** How does a Turbocharger work? https://www.youtube.com/watch?v=g5n8zt7shD4 **EPA** Environmental Compliance Guide for Auto Repair Shops https://www.ericthecarguy.com/faq/solving-

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
CCTC: TD 01.3, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1 **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	Turbocharger?	▪ Explain troubleshooting the turbocharger ▪ Explain each component of the turbocharger ▪ Demonstrate the use of the tools and equipment necessary to remove and replace the turbocharger ▪ Describe the advantages and disadvantages of turbocharger ▪ Demonstrate the proper way to remove, clean, inspect, and replace turbocharger/supercharger system components ▪ Identify the causes of turbocharger/supercharger failure; determine needed repair	chamber, turbine assembly, waste gate and actuator, compressor and oiling system. **Inspection/Checklist** Provided an engine at normal operating temperatures, tools, gauges and service manual, test and adjust waste gate. When completed the gate must open properly and smoothly to the desired manufacturer's specifications. If any deviation is noted, a reason must be stated.	automotive-electrical-problems **OSHA** Hazardous Materials https://www.osha.gov/Publications/electrical_safety.html

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
Given a typical shop repair order diagnose hot or cold starting and drivability problems of fuel injected systems. Set idle speed to specifications and remove and replace fuel injectors if needed. **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 **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	What is fuel injection? How does it work? What types of vehicles have fuel injection? What unique equipment is necessary to assess functionality in fuel injection system?	▪ Determine and adjust proper idle speed ▪ Determine causes of misfire or power loss by testing components and replace/repair components as needed. ▪ Determine causes of poor mileage, flooding, stalling, hesitation by performing appropriate checks and replace/repair components as needed. ▪ Demonstrate safety precautions when handling fuel ▪ Discuss the advantages servicing or rebuilding a fuel injection nozzle ▪ Demonstrate removal and replacement of injection nozzle	**Lab Exercise** Given a vehicle, service manual and tools, replace or service the fuel injection nozzle. When completed all bolts must be properly torqued and any lines or wires must be correctly secured and routed. Any "O" rings or seals must not leak **Lab Exercise # 2** Given a vehicle with drivability or starting problems, diagnose possible causes and make appropriate repairs to fuel injection, necessary service manuals and tools, adjust idle speed to specification. Care should be taken to use proper test equipment.	**Downloadable Auto Repair Invoice** http://www.tidyforms.com/auto-repair-invoice.html **1Aauto.com** How To Install Replace Fuel Injectors https://www.youtube.com/watch?v=ZxcOnoWZD_4

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		▪ Explain function of "O" rings ▪ Remove and replace fuel injectors		
Given a typical shop repair order diagnose, Service PCV system (Positive Crankcase Ventilation) and service evaporative control system utilizing necessary tools and equipment. **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 **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	What is the PCV 's function? The evaporative control system? What special tools are used in assessing functionality of each? What precautions are necessary when working with warm engines? Where are each located?	▪ Explain the difference between "closed" and "open" crankcase ventilation ▪ Describe a "down draft" tube operation ▪ Demonstrate manifold vacuum test for PCV hose connection port ▪ Service the PCV system and replace worn or faulty components ▪ Explain the purpose of the fuel evaporation system ▪ Describe the manner of function of this unit ▪ Identify the places where fuel evaporates and explain how	**Lab Exercise** Given a vehicle, service manual and necessary tools, test and/or repair PCV system. Upon completion the mechanic will note any faulty or worn parts. Hoses must be of the appropriate length and correctly routed. **Lab Exercise #2** Given a vehicle, service manual and necessary tools, check and service the fuel evaporation system. When completed the lines will be examined for length.	**Carparts.com** How Does a PCV System Work https://www.youtube.com/watch?v=5Kt5ubcQaK0 **AC Delco** How Battery Ignition System Works https://www.youtube.com/watch?v=OMLSNwQiiKg

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		evaporation is controlled ▪ Demonstrate method for testing the system ▪ Service evaporative control system components		
Develop the necessary skills needed for servicing thermostatic air cleaner and air injection system. Inspect, remove and replace air pump and belts if needed. **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 **CCSS: CCSS:** RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3; HSG.MG.A.1;	What is the air injection system function? The air pump system? What special tools are used in assessing functionality of each? What precautions are necessary when working with warm engines? Where are each located?	▪ Explain the purpose of the AIR system ▪ Demonstrate use of an exhaust gas analyzer ▪ Demonstrate proper exhaust gas analyzer test connections ▪ Solve any exhaust gas problems (leaks and failure to meet specifications) ▪ Explain how a faulty component in the AIR system can cause an explosion in the exhaust system ▪ Explain need for AIR system in meeting pollution standards	**Lab** Given a vehicle with defective spark plug wires, necessary service manuals and tools, replace each plug wire, routing wires according to manufacturer's specifications. Replacement wires must meet or exceed manufacturer's specifications. **Video** Create a video with fellow classmates outlining proper procedure for a vehicle needing spark plugs, necessary tools and	**AutoZone Car Care** Secondary Air Injection Pump System Operation and Diagnosis https://www.youtube.com/watch?v=SFhX-lCCB8Q **EPA** Environmental Compliance Guide for Auto Repair Shops https://www.ericthecarguy.com/faq/solving-automotive-electrical-problems

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
HSN.Q.A.1; HSN.Q.A.3		▪ 4. Demonstrate test of system with exhaust gas analyzer	equipment, remove and replace spark plugs, set plug gap and torque plugs to manufacturer's specifications and replace wires securely.	
Given circumstances of rough running engine Service Exhaust Gas Recirculation (EGR) system. Test exhaust emission using an HC/CO tester. **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 **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	What steps are involved in assessing emissions? What are the major components of emission system? What is some equipment utilized in testing HC/CO output levels?	• Explain the purpose of routing burned exhaust gas back into the engine combustion chamber • Perform test of EGR valve • Explain effect of recirculation of exhaust gases on combustion chamber. • Demonstrate safety precautions while running the engine • Define HC, CO, NOx, soot and smog • Describe procedures for testing emission • Explain what test equipment is required • Define emission	**Lab Exercise** Given a vehicle(s), necessary service manuals and tools, test and service electronic ignition system. Student should be able to test and service all makes. Test all systems and follow all test codes. Care must be taken to use proper test equipment. **Lab Exercise #2** Given a vehicle, necessary service manuals and tools, test and service an oxygen feedback system. Take care to use proper test equipment	**OSHA Website** https://www.osha.gov/law-regs.html **Auto Safety Government Website** http://www.autosafety.org/ **The Auto Parts Shop.com** How Oxygen Sensor Works https://www.youtube.com/watch?v=Fl3aD1qJrEg

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		requirements • Demonstrate test procedures	**Writing Exercise** Outline steps in assessing air/fuel system functionality	
Develop the necessary skills needed for servicing Diesel engines. Service diesel injectors. Remove and replace diesel engine fuel filters and water separator, if so equipped. **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 **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	What special equipment is used to service and work on diesel engines? What are safety precautions when dealing with diesel fuel? What types of fuel pumps are used on diesel vehicles? Where are they located in most vehicles? What is a water separator? What is its function?	• Locate fuel filter on vehicle • Locate water separator, if so equipped • Describe operation for replacement of fuel filter • Describe operation for servicing water separator • Check fuel lines for leaks when completed • Remove and replace fuel filter • Demonstrate safety precautions when handling injector nozzles • Demonstrate removal and replacement of injectors	**Lab** Given a vehicle, service manual and tools, remove and service Diesel fuel injectors. When completed test all injectors for proper spray pattern and for "O" ring leaks. Utilizing service manual service manual and tools, remove and replace diesel engine fuel filter and service water separator, if so equipped. **Inspection/Checklist** Conduct an inspection of diesel fuel system, service manual and necessary tools, diagnose the problem and make necessary repairs. Upon completion	**Diesel Engine, How it works?** https://www.youtube.com/watch?v=DZt5xU44IfQ **Putting Gasoline In A Diesel Car - What Happens?** https://www.youtube.com/watch?v=jtozuGGVFqg

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		• Describe and demonstrate servicing injectors • Inspect all fuel line fittings for leaks • Explain the use of "O" rings	the system will operate correctly.	
After performing above repair procedures check and adjust injection pump timing. Check and adjust idle and maximum speeds and remove and replace injection pump if needed. Test and service pre-heat system **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 **CCSS: CCSS:** RL.9-10.1; RI.9-10.5; SL.9-10.1 HSG.GMD.A.3;	What essential information is needed before handling diesel fuel? What types of fuel pumps and injectors are used in diesel engines? What is glow plug? What is its function?	▪ Demonstrate safety precautions when working with injector pumps ▪ Describe operation for adjusting pump timing ▪ Describe built-in advance in the pump ▪ Describe electrical controls for injector pump ▪ Describe operation of the injector pump ▪ Demonstrate timing of the pump ▪ Describe operation of injector pump ▪ Describe the timing of the pump	**Lab Exercise** Given a vehicle, service manual, necessary tools and equipment, test and service preheating or glow plug system. Care must be taken not to damage glow plugs when removing or replacing. **Journal** Write a journal entry describing steps in Given a vehicle, necessary service manual, tools and proper test equipment; diagnose a diesel engine emission problem.	**EPA** Environmental Compliance Guide for Auto Repair Shops http://www.epa.ohio.gov/portals/41/sb/publications/AutoRepairGuide.pdf **OSHA** Occupational Noise Exposure https://www.osha.gov/SLTC/noisehearingconservation

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
HSG.MG.A.1; HSN.Q.A.1; HSN.Q.A.3		▪ Describe the two types of injector pumps (mechanical and electrical) ▪ Demonstrate removal and replacement of pump ▪ Describe procedures for testing glow plugs ▪ Demonstrate test procedures ▪ Demonstrate replacement of glow plugs		

Unit 4 Vocabulary	
Diesel Choke Injection pump Water separator Timing Catalytic converter Soot Smog Distributor	Component ECM HEI Deviation Advance curve Points and condensers Resistance State-of-charge Interrelated Timing

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.html **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/