

Automotive II

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 II

Pacing Guide		
Unit	Topic	Suggested Timing
Unit 1	Automotive Engine Repair	approx. 9 weeks
Unit 2	Automotive Engine Repair Phase II	approx. 8 weeks
Unit 3	Automatic and Manual Transmissions	approx. 8 weeks
Unit 4	Suspension, Wheel and Brake Repair	approx. 10 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 II Unit: I – General Engine Diagnosis and Repair Grade Level: 9-12</p>	<p>Unit Overview: This course will introduce students to the operational and diagnostic phase of the automotive component systems. Primary focus source of engine noises and on coolant system analysis and repair. 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.2, 9.3.12.TD.6</p>	
<p>Common Career Technical Core (CCTC): TD 01.3,TD-MTN 01.1, TD-MTN 01.2, TD-MTN 02.1,TD-MTN 02.2,TD-MTN 02.3</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>Identify the proper procedures for determining source(s) of excessive noise and over heating.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD □ MTN.1, 9.3.12.TD □ OPS.2</p> <p>CCTC: TD-MTN 02.1,</p>	<p>What are the dangers associated with fans, belts and gears? How do we properly work around them in order to assess engine noise?</p> <p>What are specialty tools used to assess source of engine noise?</p> <p>What parts of the engine can be damaged</p>	<ul style="list-style-type: none"> ▪ Describe types of noises that could be heard ▪ Describe what can cause these noises ▪ Identify major parts of the engine that can be damaged because of noise malfunctions ▪ Perform noise inspection and determine why the 	<p>Lab Given an engine with a liquid cooling system, visually inspect the cooling system for leaks. Radiator fins must be free of foreign matter, the pressure cap relief valve must not discharge pressure lower than permitted on the cap, the hoses must be securely</p>	<p>EPA Automotive waste disposal page https://www.epa.gov/uic/motor-vehicle-waste-disposal-wells</p> <p>EPA Environmental Compliance Guide for Auto Repair Shops http://www.epa.ohio.gov</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>because of noise malfunctions?</p>	<p>noise is present</p> <ul style="list-style-type: none"> ▪ Describe detection technique where coolant track is inspected after area dries ▪ Inspect radiator fins for foreign matter and system for leaks ▪ Inspect hoses, fan, water pumps, belts, and core plugs for any defects ▪ Demonstrate repair of any leak or correction of other defects ▪ Demonstrate drive belt adjustment with gauge or by hand method ▪ Demonstrate inspection for internal radiator blockage 	<p>connected, hoses must not restrict flow of liquid, the fan turning freely, and all drive belts must be properly adjusted.</p> <p>Inspection/Checklist Conduct an inspection of given engine at normal operating temperature, tools, equipment and service manual, perform an operational test and determine area of noise source.</p>	<p>portals/41/sb/publication/s/AutoRepairGuide.pdf</p> <p>OSHA Hazardous Materials https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760</p>
<p>Given a typical shop repair and/or replace all associated defective components of</p>	<p>What essential information is needed on customer information form?</p>	<ul style="list-style-type: none"> ▪ Discuss needed repairs with customer to obtain permission to perform needed 	<p>Lab Exercise Given a liquid-cooled engine in operating condition and the necessary tools and</p>	<p>Downloadable Auto Repair Invoice http://www.tidyforms.com/auto-repair-invoice.html</p>

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<p>malfunctioning cooling system.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□ OPS.2</p> <p>CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1</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>repairs.</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 ▪ Inspect for leaks ▪ Remove and replace radiator ▪ Inspect auxiliary oil coolers, engine, and transmission coolers; replace as needed ▪ Explain heater and radiator hose functions ▪ Describe preformed hoses and flexible hoses ▪ Inspect hoses for faulty conditions, cracks, and soft, hard 	<p>equipment; replace water pump, thermostat.</p> <p>Lab Exercise #2 Given a vehicle with defective radiator and access to appropriate tools, equipment and service manual, remove and replace radiator and heater hoses. The radiator and its connecting components must not leak</p> <p>Journal Write a journal entry describing diagnostic steps for assessing coolant system failure.</p> <p>Venn Diagram Create a Venn Diagram that compares and contrasts the cooling system and cabin heating system.</p>	<p>Auto MD Diagnosing Automotive heating and cooling systems https://www.automd.com/diagnose/</p>

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		<ul style="list-style-type: none"> or worn spots ▪ Inspect all hose clamps and tighten ▪ Remove and replace all hoses found to be defective ▪ Explain how to test thermostat ▪ Demonstrate removal of thermostat and clean gasket surfaces ▪ Test and replace thermostat gasket ▪ Demonstrate proper tightening procedure of housing bolts ▪ Explain how to check water pump for end play and roughness in bearings and leakage ▪ Demonstrate removal of all old gasket material from mating surfaces ▪ Remove and replace water pump ▪ Torque water pump 		

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		bolts according to manufacturer's specifications		
<p>Given a set of parameters from customer perform running compression tests on cylinder and cylinder deviations.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□ OPS.2</p> <p>CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3,TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>How can we identify the common causes in engine performance malfunction due to cylinder problems? Timing issues?</p> <p>What types of tools are utilized in diagnosis?</p> <p>Which form of diagnosis is most accurate?</p> <p>What precautions are necessary when working with operating engines?</p>	<ul style="list-style-type: none"> ▪ Demonstrate safety precautions when operating test equipment on a running engine ▪ Define cylinder power balance ▪ Explain the operation of the balance tester ▪ Define R.P.M.'s for specific engine balance test ▪ Explain the reason for R.P.M. variance or drop ▪ Describe steps in preparing an engine for a cylinder compression test ▪ Perform engine vacuum test and explain relationship and affect to cylinder 	<p>Lab Exercise</p> <p>Given an engine at normal operating temperatures, test equipment, and service manual, perform a cylinder balance test. A cylinder-to-cylinder deviation exceeding manufacturer's specification must be detected</p> <p>Science Lab/Math Lab</p> <p>Utilize math formulas to develop deviations between measurements using base line manufacturer standards and scientific methods to explain relationship and affect to cylinder balance test.</p>	<p>National Fire Protection Association www.nfpa.org</p> <p>Harleysville Risk Services https://www.harleysvillegroup.com/losc/TRS/RS/RS1032.pdf</p> <p>10 Diagnostic Apps Devices to Make You a Better Driver http://www.popularmechanics.com/cars/how-to/g767/10-diagnostic-apps-and-devices-to-make-you-a-better-driver</p> <p>OSHA Improper Ventilation Causes Fire in Confined Space</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		<ul style="list-style-type: none"> balance test ▪ Explain "wet" and "dry" test and the importance of each 		https://www.osha.gov/video/shipyard_accidents/04_confined_space.html
<p>Develop the special skills needed for cleaning engines and diagnosing source of oil and coolant loss.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□ OPS.2</p> <p>CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What dangers are present when using specialized chemicals for cleaning engines? Disposing of these specials chemicals?</p> <p>What special care is needed when engine cleaning around painted surfaces?</p> <p>What gaskets? Seals? How are they utilized in engine construction?</p>	<ul style="list-style-type: none"> ▪ Describe care of related engine equipment ▪ Explain drying of distributor and wiring if a problem develops from moisture ▪ Demonstrate care of painted surfaces ▪ Identify the most likely areas on an engine that develop oil leaks ▪ Distinguish between oil seepage leaks and pressure leakage ▪ Describe the function of gaskets, gasket sealers and oil seals ▪ Demonstrate proper oil seal installation ▪ Identify parts of engine cooling 	<p>Lab Given an automobile with a dirty engine, necessary tools and equipment clean the outer surface of deposits with no damage to related components.</p> <p>Video Create a video with fellow classmates outlining proper cleaning techniques for engines.</p> <p>Inspection/Checklist Create a checklist in diagnosing coolant and oil leaks.</p>	<p>OSHA Extensive PDF file on Electrical safety https://www.osha.gov/dte/grant_materials/fy10/sh-20999-10/electrical_safety_manual.pdf</p> <p>Safely Cleaning and Engine https://www.youtube.com/watch?v=8m2qNC6JThM</p>

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		system <ul style="list-style-type: none"> ▪ Describe pressure test on cooling system ▪ Describe method to pressurize and check radiator caps ▪ Demonstrate a pressure test on the cooling system and inspect for leaks 		
<p>Given circumstances of problematic cooling systematically eliminate possibilities to assess remedy.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD.1, 9.3.12.TD.2</p> <p>CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-</p>	<p>What steps are involved in assessing cooling system remedies?</p> <p>Where are all safety precautions involved with coolant system analysis and repair?</p> <p>What are the major components of coolant system in standard gas engine? Diesel engines?</p> <p>What are federal and state guidelines in proper disposing of engine</p>	<ul style="list-style-type: none"> • Explain the effect of the cooling system on the life of the engine • Identify types of antifreeze • Demonstrate safety rules when operating flush equipment • Inspect system for leaks • Inspect coolant level again after thermostat has opened • Explain reason for reverse flush of engine cooling 	<p>Lab Exercise</p> <p>Given a liquid-cooled engine in operating condition and the necessary tools and equipment, clean and flush cooling system. After using proper procedures for cleaning and flushing the system, all connections must be leak proof and coolant must be at correct level at operating temperature. System must be rechecked after thermostat opens.</p>	<p>OSHA Website https://www.osha.gov/law-regs.html</p> <p>Auto Safety Government Website http://www.autosafety.org/</p>

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10.5; SL.9-10.1	coolants?	system <ul style="list-style-type: none"> ▪ Flush the cooling system ▪ Test the coolant for freeze protection and PH readings ▪ Explain correct mixture of water and antifreeze for proper protection ▪ Recover and recycle old antifreeze or install new antifreeze ▪ Tell how to properly dispose of old antifreeze ▪ Describe how the radiator cap controls the sealed system and explain the purpose for pressurizing the system ▪ Test the radiator cap 	<p>Writing Exercise Outline steps in assessing coolant system functionality</p> <p>Lab Exercise #2 Given an automobile that is operational, visually inspect and physically examine heater and radiator hoses, and replace them if necessary. All cracked, soft or worn hoses and leaks must be detected</p>	
Identify engine problems due to cylinder malfunction by	What are the steps involved in detecting cylinder (piston)	<ul style="list-style-type: none"> ▪ Explain method to prepare engine for cylinder leakage test 	<p>Lab Given an engine at normal operating temperature, tools,</p>	<p>Family Handy Man Automotive Tools for Assessing Noise http://www.familyhandym.com</p>

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<p>performing cylinder compression and leakage tests.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□ OPS.2</p> <p>CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1</p> <p>CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>problems in the engine? How do we properly assess engine noise?</p> <p>What are specialty tools used to assess source of engine noise?</p> <p>What parts of the engine can be damaged because of cylinder malfunctions?</p>	<ul style="list-style-type: none"> ▪ Identify parts of cylinder leakage tester ▪ Demonstrate use of cylinder leakage tester ▪ Record and compute differences in pressure leakage of cylinder • Describe deviations from specifications and explain causes 	<p>equipment, and service manual, perform a cylinder leakage test following the manufacturer's recommended procedures. Leakage in excess of manufacturer's specifications must be noted and explained.</p> <p>Inspection/Checklist Conduct an inspection of given engine at normal operating temperature, tools, equipment and service manual, perform an operational test and determine area of noise source.</p>	<p>an.com/tools/automotive-tools/top-auto-mechanic-tools/view-all</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>
<p>Given a typical shop repair work order determine source(s) of oil loss and/or replace all associated defective components, gaskets and seals.</p>	<p>What essential information is needed on customer information form?</p> <p>How can the customer information sheet be used to diagnose</p>	<ul style="list-style-type: none"> ▪ Identify the most likely areas on an engine that develop oil leaks ▪ Identify oil leaks that make other areas appear to be leaking oil 	<p>Lab Exercise Given an engine at operating temperature, examine the engine for oil leaks. All seals and gaskets must be securely fitted with no</p>	<p>Downloadable Auto Repair Invoice http://www.tidyforms.com/auto-repair-invoice.html</p> <p>MAC Tools Specialty Tools for Oil Leaks</p>

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<p>Given a set of parameters from customer perform running compression tests on engine oil pressure.</p>	<p>How can we identify the common causes in engine performance malfunction due to high/low oil pressure?</p> <p>What types of tools are</p>	<ul style="list-style-type: none"> ▪ Demonstrate safety precautions when operating test equipment on a running engine ▪ Identify connection where oil pressure 	<p>Lab Exercise</p> <p>Given an engine, service manual, proper tools, and test equipment, test the oil pump pressure. Any deviation from manufacturer's</p>	<p>10 Diagnostic Apps Devices to Make You a Better Driver http://www.popularmechanics.com/cars/how-to/g767/10-diagnostic-apps-and-devices-to-</p>

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<p>Develop the special skills needed for removal of engine and associated components; engine mounts.</p> <p>NJSLS: 9.3.12.TD.2,</p>	<p>What dangers are present when using car and engine lifts?</p> <p>How is engine attached to vehicle chassis?</p> <p>When is it necessary to remove engine from</p>	<ul style="list-style-type: none"> ▪ Demonstrate safety procedures ▪ Explain the function of engine mounts ▪ Demonstrate removal of broken engine mounts (engine will 	<p>Lab</p> <p>Given an automobile in need of engine mounts, tools, equipment and service manual, remove and replace engine mounts according to manufacturer's</p>	<p>OSHA Extensive PDF file on Electrical safety https://www.osha.gov/dte/grant_materials/fy10/sh-20999-10/electrical_safety_manual.pdf</p>

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Unit 1 Vocabulary

Radiator
Malfunction
Relief valve
Foreign matter
Catalysts
Core plugs
Liquid-cooled
Gauge
Deviation
Component
Thermostat
Diagnostic
Gasket
Deviation
Deteriorated
Vacuum
Oil seal
Seepage
OSHA
EPA

Diesel
Remedy
PH readings
Antifreeze
Radiator cap
Pressurizing
Piston
Compliance

Suggested Unit Projects

Choose At Least One

Management/Organizational Exercise

Develop meeting criteria and parameters for Automotive Enthusiast Club in school.

Individual/Group Project

Develop training tools for cooling system. Example: cut radiator in half to expose inner workings in order to train underclassman on basics of cooling system.

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/>