

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. 8 weeks
Unit 2	Automotive Engine Repair Phase II	approx. 9 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 flywheel and inspect and measure flywheel run-out. Remove and replace flywheel and ring gear.</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 is a flywheel? Flywheel ring gear?</p> <p>What is the function of the flywheel? How can it deteriorate?</p> <p>What engine damage can occur from damaged flywheel?</p>	<ul style="list-style-type: none"> Demonstrate safety procedures when working under a raised vehicle Describe how a dial indicator is used to measure run-out Demonstrate the testing procedure of flywheel run-out Inspect condition of flywheel surface and 	<p>Lab Given a flywheel, service manual, necessary tools, and a dial indicator, measure flywheel run out for serviceability</p> <p>Lab #2 Given a vehicle, service manual and necessary tools, remove and replace the flywheel and</p>	<p><u>My Automatic Transmission</u> Do-it-Yourself Guide for a Rear Wheel Drive Vehicle http://myautomatictransmission.com/diy-remove-automatic-transmission-RWD.htm</p> <p><u>Do It Yourself.com</u> How to Replace an Engine Flywheel</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1 CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1		<ul style="list-style-type: none"> • starter ring gear • Demonstrate removal of a flywheel and related parts • Inspect the flywheel for clutch surface wear and starter ring gear damage • Demonstrate replacement of a flywheel, torqueing of bolts, and locking procedure of bolts • Explain methods of removing the old ring • Demonstrate how to replace flywheel ring gear • Inspect installed ring gear for alignment 	ring gear. Bolt torque will coincide with manufacturer's specifications and locking tabs must be correctly secured	http://www.doityourself.com/stry/how-to-replace-an-engine-flywheel
Identify engine lubrication systems. Assess functional effectiveness and replace faulty	How are engines lubricated? What products are used in lubrication? Synthetics? What are the major	<ul style="list-style-type: none"> • Demonstrate safety procedures while working under vehicle • Demonstrate proper jacking and supporting of vehicle 	Lab Given a vehicle with a damaged pan, necessary tools, equipment and service manual, remove pan and replace	YouTube How Engine Lubrication System Works https://www.youtube.com/watch?v=mmmcyj53TNic

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>components.</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>components of the lubrication system?</p> <p>What systems need maintenance in regards to lubrication?</p> <p>How does the lubrication system also regulate the engine temperature?</p>	<ul style="list-style-type: none"> • 3Discuss handling of fluids • Describe procedures of getting proper clearance between pan and frame to remove pan • Demonstrate cleaning pan area before reinstalling pan • Demonstrate pan removal from engine with engine out of vehicle • Explain precautions of installation of new pan gasket when putting pan on engine • Explain working procedure of oil pump and bypass valve • Describe the function of the by-pass valve • Demonstrate measurement of gear or rotor of pump for excessive wear • Demonstrate 	<p>pan. Oil pan must not leak when replaced.</p> <p>Lab #2 Given automobile engine needing an oil pump, a replacement oil pump, necessary tools, and proper service manual, remove and replace pump according to manufacturer's procedures. The pump must operate after installation at manufacturer's performance level without malfunction.</p> <p>Venn Diagram Illustrate the differences and similarities between Oil pump and Water pump and their functions in cooling the engine.</p>	<p>YouTube Oil Pan Basics https://www.youtube.com/watch?v=BiPOCbwKE1o</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		operational test for specification pressure <ul style="list-style-type: none"> • Prime oil pump prior to installation 		
Measure and inspect engine components for proper tolerances block, crankshaft, and pistons. NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□ OPS.2 CCTC: TD-MTN 02.1, TD-MTN 02.2, TD-MTN 02.3, TD-HSE 1.1 CCSS: RL.9-10.1; RI.9-10.5; SL.9-10.1	What is a tolerance? Why are tolerances important when repairing and engine? What special tools are used in measuring tolerances? What math skills are used? How can visible wear on parts indicate out of tolerance?	<ul style="list-style-type: none"> • Explain use of micrometers • Demonstrate measuring techniques while using inside and outside micrometers (any deviation from manufacturer's specification must be noted) • Inspect all parts subject to reuse for wear • Describe parts found not to meet specifications 	Lab Given engine parts (block, crankshaft, pistons), necessary tools, special measuring instruments, and service manual, measure all engine parts for wear.	YouTube Micrometer Basics: Use, Care and Calibration https://www.youtube.com/watch?v=VU23AllU0Cg YouTube How to Measure Piston to Cylinder Clearance https://www.youtube.com/watch?v=hdTW_RBR3Aw
Remove and replace major engine components: crankshafts, camshafts mains, and rod bearings.	What are the camshafts and crankshaft? What is their primary function? How are they measured	<ul style="list-style-type: none"> • Describe torque procedure for main bearings • Explain "line" bored • Demonstrate bearing 	Lab Given an engine block prepared for assembly, necessary tools, equipment, and service	Crankshaft Repair Crankshaft Diagram and Terminology http://crankshaftrepair.org/diagram-and-

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>Adjust or replace hydraulic lifters, valves and seats.</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>for proper tolerances?</p> <p>What safety precautions are necessary when replacing?</p> <p>What is torque? How is it used to determine tolerances in piston components?</p> <p>What are lifters? Valves? Seats? How are all interconnected?</p>	<p>fitting and proper main bearing positioning with oil seals in place</p> <ul style="list-style-type: none"> • Demonstrate proper procedure to examine crankshaft end play • Explain use of plasti-gauge for checking clearance • Explain care of crank when removing and replacing rods • Explain why rods and mains are position marked when disassembled • Explain function of camshaft • Demonstrate procedure for determining wear and inspecting lifters • Adjust intake exhaust and valve lash using flat feeler gauge of correct thickness according 	<p>manual, replace the main bearings, oil seals, and crankshaft according to the manufacturer's procedure. All main bearings' caps will be installed as numbered in indicated position, properly torqued to manufacturer's specification.</p> <p>Lab #2 Given an automobile engine, service manual, necessary tools and equipment, remove and replace the camshaft according to manufacturer's specifications. Inspect camshaft lobes for wear in excess of manufacturer's specification</p> <p>Lab #3 Given an automobile</p>	<p>terminology/</p> <p>YouTube Camshaft & Valve Animation Training https://www.youtube.com/watch?v=itE2JWqdTqE</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		<ul style="list-style-type: none"> • to manufacturer's specifications • Explain the necessity for valve lash variation between the intake and exhaust valves • Explain various methods of adjusting valve lash • Demonstrate removal and replacement of camshaft • Explain camshaft function and need for proper bearing fit and placement • Replace camshaft gear and timing chain and related parts • Demonstrate operational test and inspect for external leakage 	<p>engine with mechanical valve lifters, tools, equipment and service manual, adjust the exhaust and intake valve lash according to manufacturer's specifications.</p> <p><u>Presentation</u> Utilizing choice of medium provide step by step procedure for either Camshaft or Crankshaft</p>	
Remove and replace major engine components: pistons and	What are pistons? What is their function? How do we ascertain their	<ul style="list-style-type: none"> • Demonstrate safety procedures for installation of each 	<p><u>Lab</u> Given an engine, service manual, tools and</p>	<p><u>Mechanical Engineering:</u> What is the purpose of</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>rings.</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>optimum functionality?</p> <p>What are rings? What is their function in the engine? What can happen if the rings fail?</p> <p>What can happen to an engine if there is Piston failure? Ring failure?</p> <p>How do we replace faulty Pistons? Rings?</p>	<p>component (Piston, Rings)</p> <ul style="list-style-type: none"> • Demonstrate use of ring compressor and explain ring protection • Demonstrate torque of rod bearing caps • Explain reason for lubricating parts prior to installation • Demonstrate procedures for protecting crankshaft when installing pistons • Inspect and measure piston ring side clearance and end gap • Install piston rings on pistons to manufacturer's specifications 	<p>special equipment, remove and replace rings, pistons, rods and bearings according to manufacturer's specifications.</p> <p>Venn Diagram Illustrate the interdependence of the piston and rings.</p>	<p>piston ring and oil rings? https://www.quora.com/Mechanical-Engineering-What-is-the-purpose-of-piston-ring-and-oil-rings</p> <p>Piston Ring Basics: Understanding Ring Function https://www.youtube.com/watch?v=Q0enkgvoTJw</p>
<p>Engine block maintenance. Remove, clean, inspect and</p>	<p>What is the engine block? How the pistons and engine block</p>	<ul style="list-style-type: none"> • Explain head bolt torque sequence • Demonstrate use of 	<p>Lab Given a vehicle with cylinder head</p>	<p>How It's Made Engine Block https://www.youtube.com</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>replace cylinder heads; inspect head for cracks and warpage.</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>associated?</p> <p>Where are the cylinder walls located? What is glazing? Why is this important?</p> <p>What is a head gasket? What is its function?</p>	<p>torque wrench</p> <ul style="list-style-type: none"> • Demonstrate removal of cylinder head and related components • Inspect cylinder head for warpage, cracks, burned valves, or other damage • Describe valve sealing, valve grinding, head milling or other related repairs • Identify intake and exhaust ports and explain their functions • Inspect water jacket • Describe front to rear head gasket coolant passage holes • Demonstrate replacement of head gasket, cylinder head, intake and exhaust manifold • Demonstrate tightening sequence of cylinder head and 	<p>malfunctions, service manual, necessary tools and equipment, remove and replace cylinder heads in accordance with manufacturer's procedure. All attaching hardware must be torqued and head gasket and manifolds must not leak.</p> <p>Art Project Poster illustrating a “cut-away” view of an engine.</p>	<p>/watch?v=wr4_B9EXWS0</p> <p>How It's Made Engine Pistons https://www.youtube.com/watch?v=dVLrAce8IHE</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		<ul style="list-style-type: none"> manifold bolts • Demonstrate operational test of engine (recheck cooling system liquid after thermostat opens) • Demonstrate ridge reamer's placement in cylinder • Demonstrate removal of ridge from cylinder • Explain reason for deglazing cylinder walls • Demonstrate deglazing procedure • Demonstrate cleaning of cylinder walls after deglazing 		
<p>Remove and replace major engine components: Intake and exhaust manifolds.</p> <p>NJSLS: 9.3.12.TD.2, 9.3.12.TD.6, 9.3.12.TD□ MTN.1, 9.3.12.TD□</p>	<p>What is the Intake Manifold? What is its function?</p> <p>What is the Exhaust Manifold (Header)? What is its function?</p>	<ul style="list-style-type: none"> • Demonstrate safety procedures • Explain function of intake manifold • Describe function of intake manifold heat passage 	<p>Lab Given a vehicle with an intake manifold problem, service manual, necessary tools and equipment, inspect intake manifold for warp or cracks.</p>	<p>Intake Manifold Explained https://www.youtube.com/watch?v=oMjAtDGdWRM</p> <p>Exhaust Header Explained</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
<p>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 engine problems originate from the (2) different manifolds?</p>	<ul style="list-style-type: none"> • Demonstrate removal of intake manifold and old gasket material • Inspect for leaks, warpage, cracks • Demonstrate replacement of intake manifold and related parts • Demonstrate operational test 	<p>Attachments and intake manifold must be torqued according to manufacturer's specifications</p> <p>Inspection/Checklist Create list correct procedure for removal and installation of exhaust and intake manifolds.</p>	<p>https://www.youtube.com/watch?v=zi2BexMQIZY</p>
<p>Remove and replace major engine components: timing chains, gears, belts.</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 are the functions of the Timing gears and chain/belt?</p> <p>What damage can occur if belt/chain breakage occurs?</p> <p>How is wear damage assessed in these key components?</p>	<ul style="list-style-type: none"> • Explain bleed down process • Demonstrate adjustment procedures (where possible) • Demonstrate bleed down test of valve lifters • Explain problems of weak, badly worn or damaged lifters • Demonstrate replacement of defective valve lifters 	<p>Lab Given any automobile engine, service manual, necessary tools and equipment, remove and replace harmonic balancer, timing chain cover, timing gears and chain. Timing must be set according to manufacturer's specifications and cover will not leak. Harmonic balancer must be inspected for wear and</p>	<p>How to Video Remove and Replace the Timing Belt on a Toyota Camry https://www.youtube.com/watch?v=3rNZgg-c22w</p> <p>Different types of Timing sets Timing Belt vs. Timing Chain vs. Timing Gear https://www.youtube.com/watch?v=5BGzK-zCLYk</p>

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		<ul style="list-style-type: none"> • Inspect valve guides for wear, check valve guide height and stem-to-guide clearance; recondition or replace as needed. • Explain timing marks on balancer, cover and gears • Explain procedure for proper positioning of timing marks • Demonstrate engine timing in accordance with manufacturer's specifications • Inspect related parts (harmonic balancer, key, shaft, etc.) for excessive wear and slippage • Replace parts and test for operation and leaks • Explain use of auxiliary drive shafts (i.e. balance shafts, 	<p>slippage.</p> <p>Lab #2 Given an automobile with timing belt, service manual, tools and equipment, remove and replace timing belt. Set timing and tension according to manufacturer's specifications.</p>	

Student Learning Objectives (SLOs)	Essential Questions	Skills & Indicators	Sample Activities	Resources
		idler shafts, counter balance or silencer shafts) <ul style="list-style-type: none"> • Demonstrate timing of auxiliary shafts according to manufacturer’s specifications 		
<p>Remove and replace major engine components: Rocker arm assemblies, inspect wear and lubrication.</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 are the Rocker Arms? How can improper installation lead to major engine failure?</p> <p>Why is lubrication of Rocker arms important? How is this done?</p> <p>What is a “Sweep Pattern?” How is it used to assess Rocker Arm functionality?</p>	<ul style="list-style-type: none"> • Demonstrate safety precautions when operating an engine with valve cover removed • Explain rocker arm lubricating system • Describe valve rocker arm function • Inspect valve rocker arm assemblies (or independent rockers) for lubrication • Describe any rocker arm problem (lubrication, wear, broken or adjustment) 	<p>Lab Given a vehicle with rocker arm problem, service manual, and necessary tools, remove valve cover and inspect rocker arms for proper lubrication and wear, and replace rocker arm assembly, if necessary.</p> <p>Math Exercise Utilizing basic Geometry assess the correct length of the pushrods in relation to the rocker arms.</p>	<p>Rocker Arms Understanding Rocker Arm Geometry https://www.youtube.com/watch?v=p0F--yFLcAk</p> <p>Video What Happens When You Don't Change Your Oil https://www.youtube.com/watch?v=KC-SxrsgEwo</p>

Unit 2 Vocabulary

Tolerances
 Crankshaft
 Camshaft
 Bearing
 Plasti-gauge
 Rods
 Lobes
 Lifters
 Bearing
 Bored
 Crank
 Ring
 Rod bearing
 Deglazed
 Ringridge
 Reamer
 Manifold
 Intake
 Warpage
 Malfunction

Water jacket
 Head gasket
 Thermostat
 Hydraulic lifter
 Reface
 Seats
 Bind
 Harmonic balancer
 Timing
 Slippage
 Idler shafts
 Counter balance
 Silencer shafts
 Timing belt

Suggested Unit Projects

Choose At Least One

Writing Exercise

Write a safety pamphlet outlining a safety procedure in the Lab

Group Exercise

In a group create an action plan for improving safety in the Lab.

Suggested Structured Learning Experiences

Youth and Adult Automotive Training Center in Newark
 201 Bergen St, Newark, NJ 07103
[https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8-q=Youth and Adult Automotive Training Center in Newark&tbs=lf:1,lf_ui:2&rflfq=1&rlha=0&rlag=40740789,-74189932,406&tbm=icl&rdimm=1045171484867486717](https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8-q=Youth+and+Adult+Automotive+Training+Center+in+Newark&tbs=lf:1,lf_ui:2&rflfq=1&rlha=0&rlag=40740789,-74189932,406&tbm=icl&rdimm=1045171484867486717)

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 1800 Bay Ave. Building #13
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