



# **Automotive I**

## ***Course Description***

This course will introduce students to the operational and scientific nature of the automotive component systems including fuel, intake, exhaust, ignition, lubrication, braking, cooling, and suspension 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 I

Pacing Guide		
Unit	Topic	Suggested Timing
Unit 1	Basic Automotive Knowledge and Service	approx. 6 weeks
Unit 2	Basic Automotive Tools and Equipment	approx. 7 weeks
Unit 3	Basic Automotive Skills	approx. 17 weeks
Unit 4	Leadership and Employability Skills	approx. 5 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"> <li>Extra time for assigned tasks</li> <li>Adjust length of assignment</li> <li>Timeline with due dates for projects</li> <li>Communication system between home and school</li> <li>Provide notes/outline</li> </ul>	<ul style="list-style-type: none"> <li>Extra Response time</li> <li>Have students verbalize steps</li> <li>Repeat, clarify or reword directions</li> <li>Mini-breaks between tasks</li> <li>Provide a warning for transitions</li> <li>Work partners</li> </ul>	<ul style="list-style-type: none"> <li>Precise step-by-step directions</li> <li>Short manageable tasks</li> <li>Brief and concrete directions</li> <li>Provide immediate feedback</li> <li>Small group instruction</li> <li>Emphasize multi-sensory learning</li> </ul>	<ul style="list-style-type: none"> <li>Teacher-made checklist</li> <li>Use visual graphic organizers</li> <li>Reference resources to promote independence</li> <li>Visual and verbal reminders</li> <li>Graphic organizers</li> </ul>
<u>Assistive Technology</u>	<u>Tests/Quizzes/Grading</u>	<u>Behavior/Attention</u>	<u>Organization</u>
<ul style="list-style-type: none"> <li>Computer/whiteboard</li> <li>Audio Recorder</li> <li>Spell-checker</li> <li>Audio-taped books</li> </ul>	<ul style="list-style-type: none"> <li>Extended time</li> <li>Study guides</li> <li>Shortened tests</li> <li>Read directions aloud</li> </ul>	<ul style="list-style-type: none"> <li>Consistent daily structured routine</li> <li>Simple and clear classroom rules</li> <li>Frequent feedback</li> </ul>	<ul style="list-style-type: none"> <li>Individual daily planner</li> <li>Display a written agenda</li> <li>Note-taking assistance</li> <li>Color code activities</li> </ul>



## 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><b>Course:</b> Automotive I</p> <p><b>Unit:</b> III – Basic Automotive Skills</p> <p><b>Grade Level:</b> 9-12</p>	<p><b>Unit Overview:</b></p> <p>This course will introduce students to the operational and scientific nature of the automotive component systems including fuel, intake, exhaust, ignition, lubrication, braking, cooling, and suspension systems. Practical application of safe work habits and the correct use of tools and precision test instruments will be the focus of this unit. Understanding of basic automotive tools is an essential step in fulfilling the training that is needed for an automotive service career.</p>
<p><b>New Jersey Student Learning Standards (NJSLS):</b> 9.3.12.TD.1, 9.3.12.TD.2, 9.3.12.TD.3, 9.3.12.TD.6</p>	
<p><b>Common Career Technical Core (CCTC):</b> TD-MTN 02.2,TD-MTN 02.3, TD-HSE 1.3</p>	
<p><b>Common Core State Standards (CCSS):</b> 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, choose and service the vehicle with the proper lubricants. Follow manufacturer’s specifications in selecting the lubricants</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p>	<p>What are the 3 main lubricants involved in a basic automotive service?</p> <p>Why is it important to monitor and change lubricants and recommended intervals?</p> <p>What are some of the specialty lubricants used in modern vehicles?</p>	<ul style="list-style-type: none"> <li>• Explain grading of oils and properties of grease</li> <li>• Explain oil service classifications and viscosity numbers                             <ul style="list-style-type: none"> <li>▪ Identify correct engine oil and oil filter, being careful to select the proper filter.</li> <li>▪ Demonstrate how to use special</li> </ul> </li> </ul>	<p><b>Lab Exercise</b></p> <p>Given a vehicle and access to service manuals, tools and equipment, service the vehicle with the proper lubricants. Follow manufacturer’s specifications in selecting the lubricants and filters.</p>	<p><b>OSHA Website</b>  <a href="https://www.osha.gov/law-regs.html">https://www.osha.gov/law-regs.html</a></p> <p><b>Auto Safety Government Website</b>  <a href="http://www.autosafety.org/">http://www.autosafety.org/</a></p> <p><b>Automotive Lubricant Glossary of Terms</b>  <a href="http://lubricants.s5.com/glossary.htm">http://lubricants.s5.com/glossary.htm</a></p>



<p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What are the proper procedures for disposing of certain lubricants?</p>	<p>lubrication tools</p> <ul style="list-style-type: none"> <li>▪ Explain how to service the transmission transaxle and differential</li> <li>▪ Explain how to service the transfer assembly</li> </ul>	<p><b><u>Writing Exercise</u></b>          Explain in an essay the importance of selecting the correct lubricants and replacing at manufacturers recommended intervals.</p>	
<p>Identify and demonstrate the use of shop manuals and tune up charts.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>How can we identify correct manual for a specific model of automobile?</p> <p>How are parts listed for replacement?</p> <p>What is an exploded view of a part or component?</p> <p>What is a tune up chart? Wiring Diagram?</p> <p>Where are the vacuum and emission sections located?</p>	<ul style="list-style-type: none"> <li>▪ Explain how to select manuals to locate information needed</li> <li>▪ Demonstrate the ability to cross reference from one repair manual to another</li> <li>▪ Demonstrate locating part's cost</li> <li>▪ Explain and determine flat rate time</li> <li>▪ Locate repair procedure from a computerized database</li> <li>▪ Demonstrate the ability to use a manufacturer's repair manual</li> <li>▪ Explain how to locate</li> </ul>	<p><b><u>Journal</u></b>          Write a journal entry outlining procedure for locating major repair sections</p> <p><b><u>Venn Diagram</u></b>          Create a Venn Diagram that cross-references between different repair manuals.</p> <p><b><u>Writing Exercise</u></b>          Create a auto manual entry describing an exploded view of automotive component</p>	<p><b><u>Chilton ASE Education Manuals</u></b>  <a href="http://www.chilton.cengage.com/">http://www.chilton.cengage.com/</a></p> <p><b><u>Free Downloadable Car Service Manuals</u></b>  <a href="http://www.carcare.org/car-care-service-schedules/custom-service-schedule/?gclid=COvgs66Qtc4CFcZahgodK9MF7w">http://www.carcare.org/car-care-service-schedules/custom-service-schedule/?gclid=COvgs66Qtc4CFcZahgodK9MF7w</a></p> <p><b><u>National Highway Traffic Safety Administration</u></b>  <a href="http://www.nhtsa.gov/Vehicle+Safety">http://www.nhtsa.gov/Vehicle+Safety</a></p>

		<p>and use a tune-up chart</p> <ul style="list-style-type: none"> <li>▪ Explain the location of tune-up decals</li> </ul>		
<p>Demonstrate knowledge of automotive tubing types and sizes.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What specialty tools are used to measure inside diameter (I.D.) and outside diameter (O.D.)?</p> <p>When should the specific types of tubing be used in automotive repair?</p> <p>What are the primary fasteners and connectors when using tubing?</p>	<ul style="list-style-type: none"> <li>▪ Define the terms "I.D." and "O.D."</li> <li>▪ Demonstrate knowledge of steel and flex gas tubing</li> <li>▪ Demonstrate knowledge of evaporative and vacuum hoses</li> <li>▪ Demonstrate correct use of tubing connectors and fasteners</li> <li>▪ Explain where each type automotive tubing should be used</li> </ul>	<p><b>Lab Exercise</b>            Given a variety of sizes and types of automotive tubing, correctly identify them and common uses.</p> <p><b>Science Lab</b>            Web quest "How Welding Works"  <a href="http://science.howstuffworks.com/welding1.htm">http://science.howstuffworks.com/welding1.htm</a></p>	<p><b>AutoEducation.com</b>  <a href="http://www.internet4classrooms.com/ct-auto.htm">http://www.internet4classrooms.com/ct-auto.htm</a></p> <p><b>OSHA</b>            Welding, Cutting, Brazing  <a href="https://www.osha.gov/SLTC/weldingcuttingbrazing/standards.html">https://www.osha.gov/SLTC/weldingcuttingbrazing/standards.html</a></p> <p><b>Miller Welding</b>            MIG Welding Basics for Automotive Repair  <a href="https://www.millerwelds.com/resources/article-library/mig-welding-basics-for-farm-and-automotive-repair">https://www.millerwelds.com/resources/article-library/mig-welding-basics-for-farm-and-automotive-repair</a></p>
<p>Develop the special skills and knowledge associated with electrical soldering. Demonstrate basic ability in electrical soldering.</p>	<p>How can soldering be used to repair exposed frayed wires and power cables?</p> <p>What different types of solder are used? Why is proper identification</p>	<ul style="list-style-type: none"> <li>▪ Explain the results of too little heat and too much heat when soldering.</li> <li>▪ Demonstrate knowledge of types of solder: (a) acid core;</li> </ul>	<p><b>Lab Exercise</b>            Given pieces of wire and proper tools, properly join the wires together by soldering.</p> <p><b>Diagram</b>            Proper procedure for</p>	<p><b>Western Michigan Univ.</b>            Extensive PDF file on General Shop Safety  <a href="http://wmich.edu/engineer/ceee/edcsl/pdf/f212_safety_rules.pdf">http://wmich.edu/engineer/ceee/edcsl/pdf/f212_safety_rules.pdf</a></p> <p><b>UAW Electrical Safety</b></p>

<p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>important?</p> <p>Why is eye and skin protection important when soldering? What is the protective equipment utilized?</p>	<ul style="list-style-type: none"> <li>▪ (b) rosin core; and</li> <li>▪ (c) solid solder</li> <li>▪ Explain the use of soldering paste</li> <li>▪ Explain and demonstrate proper joining before soldering</li> <li>▪ from a shaft using a hydraulic press</li> <li>▪ Explain and demonstrate proper covering after soldering: (a) electrical tape; and (b) heat shrink tubing</li> </ul>	<p>using soldering gun</p> <p><b>Inspection/Checklist</b>            Create detailed procedure for checking soldering gun before operation</p>	<p>Excellent work safety PDF on Auto specific electrical safety  <a href="https://www.osha.gov/dte/grant_materials/fy09/sh-18794-09/electrical_safety_manual.pdf">https://www.osha.gov/dte/grant_materials/fy09/sh-18794-09/electrical_safety_manual.pdf</a></p> <p><b>OSHA</b>            Hand and Power Tool Safety  <a href="https://www.osha.gov/Publications/osa3080.pdf">https://www.osha.gov/Publications/osa3080.pdf</a></p>
<p>Identify proper manuals and test equipment utilized in electronic theory in basic automotive maintenance and repair.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p>	<p>What is magnetism? What role does it play in automotive maintenance?</p> <p>What role do Ohms law, E.I.R and Electrical current play in electrical theory?</p> <p>What is the difference between voltage, current, and resistance?</p>	<ul style="list-style-type: none"> <li>▪ Explain: (a) magnetism; (b) electrical current flow; (c) Ohm's law</li> <li>▪ Explain what happens when an electrical current is applied to a magnet</li> <li>▪ Explain what E.I.R. means</li> <li>▪ Explain the difference between voltage, current, and resistance</li> </ul>	<p><b>Prezi/Power Point/Poster</b>            Given proper manuals and test equipment, explain magnetism, electrical current, Ohm's law, and electronic theory.</p> <p><b>Math Exercise</b>            Define the calculations to determining Electric Input Ration (EIR)</p>	<p><b>Electric Input Ratio</b>            How to calculate PDF  <a href="http://esl.tamu.edu/docs/terp/2013/ESL-TR-13-04-01-DRAFT.pdf">http://esl.tamu.edu/docs/terp/2013/ESL-TR-13-04-01-DRAFT.pdf</a></p> <p><b>OSHA</b>            Electrical Safety  <a href="https://www.osha.gov/Publications/electrical_safety.html">https://www.osha.gov/Publications/electrical_safety.html</a></p>

<p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>				
<p>Use basic electrical equipment and meters to test automotive electrical system and ancillary components</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What are the safety precautions necessary when assessing electrical components?</p> <p>What are primary signs of electrical system failure?</p> <p>What are some of the specialty equipment utilized when testing automotive electrical systems?</p>	<ul style="list-style-type: none"> <li>▪ Demonstrate safety precautions when connecting and disconnecting the test equipment</li> <li>▪ Describe use of the electrical tester</li> <li>▪ Demonstrate the use of an ohm meter and multimeter</li> <li>▪ Describe analog and digital test meters</li> <li>▪ Demonstrate the use of a test light</li> </ul>	<p><b>Inspection/Checklist</b>            Demonstrate proper connecting and disconnecting of the electrical test equipment</p> <p><b>Prezy/Power Point</b>            Describe the operation of an electrical analyzer</p> <p><b>Lab Exercise</b>            Given a vehicle, connect the electrical and electronic testers into the electrical sys</p>	<p><b>Automotive Electrical Fundamentals</b>            Online tutorials on Automotive electrical Systems  <a href="http://www.autoshop101.com">http://www.autoshop101.com</a></p> <p><b>OSHA</b>            Electrical safety  <a href="https://www.osha.gov/SLTC/electrical/index.html">https://www.osha.gov/SLTC/electrical/index.html</a></p>
<p>Utilizing basic electrical theory apply the rules of series, parallel, series-parallel circuits.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p>	<p>What are the different types of circuits used in Automotive electrical equipment?</p> <p>What safety precautions are used when working on live electrical circuits?</p> <p>What is needed to complete an electrical circuit?</p>	<ul style="list-style-type: none"> <li>▪ Demonstrate safety precautions when working on live electrical circuits</li> <li>▪ Explain why a closed loop of wire does not necessarily make a circuit</li> <li>▪ State the series circuit laws</li> <li>▪ State total voltage</li> </ul>	<p><b>Lab Exercise</b>            Given a breadboard, electrical wire, resistors, and proper test equipment, build a series circuit and explain the series circuit laws</p> <p><b>Venn Diagram</b>            Compare and contrast “parallel circuits”, “series circuits” and “series</p>	<p><b>Energy.gov</b>            Plug in Electric Vehicles and Batteries  <a href="http://energy.gov/eere/vehicles/vehicle-technologies-office-plug-electric-vehicles-and-batteries">http://energy.gov/eere/vehicles/vehicle-technologies-office-plug-electric-vehicles-and-batteries</a></p> <p><b>How a Car Works</b>            How a cars electrical system works</p>

<p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What is resistance in an electrical circuit? How is resistance calculated?</p> <p>What are voltage drop and current flow in an electrical circuit? How are they calculated?</p>	<ul style="list-style-type: none"> <li>▪ drop in a series circuit</li> <li>▪ State the current flow in the circuit</li> <li>▪ State the total resistance in the circuit</li> <li>▪ State the parallel circuit laws</li> <li>▪ Explain the difference between series and parallel circuits</li> <li>▪ Explain what happens to current when resistance is added to a parallel circuit</li> <li>▪ Explain why combined resistance in a parallel circuit is less than the smallest resistor</li> </ul>	<p>parallel circuits.”</p> <p><b>Math Exercise</b></p> <p>Diagram equations for determining resistance, volts and Ohms in an electrical circuit.</p>	<p><a href="http://www.howacarworks.com/basics/how-car-electrical-systems-work">http://www.howacarworks.com/basics/how-car-electrical-systems-work</a></p>
<p>Identify proper manuals and test equipment utilized in steering and suspension geometry</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE</p>	<p>What is caster and camber? What role do they play in steering geometry?</p> <p>What is “toe?” What does “toe in” and “toe out?”</p> <p>What is four wheel steering? Four wheel</p>	<ul style="list-style-type: none"> <li>▪ Explain caster and camber angle</li> <li>▪ Explain toe in and toe out</li> <li>▪ Explain king pin inclination</li> <li>▪ Define four wheel steering and alignment</li> </ul>	<p><b>Math Exercise</b></p> <p>Define the principles behind steering geometry and its importance in automotive steering</p> <p><b>Inspection/Checklist</b></p> <p>Outline safety precautions when</p>	<p><b>Carparts.com</b></p> <p>A Short Course on Wheel Alignment</p> <p><a href="http://www.carparts.com/alignment.htm">http://www.carparts.com/alignment.htm</a></p> <p><b>Goodyear Auto Service</b></p> <p>Suspension Basics</p> <p><a href="http://www.goodyearauto.com/content/content.jsp?pageName=Susp">http://www.goodyearauto.com/content/content.jsp?pageName=Susp</a></p>

<p>1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>alignment?</p>		<p>working with alignment tools</p>	<p><a href="#">ensionSystems</a></p>
<p>Identify and explain the functions of steering and suspension components.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What are king pins? What role do they play in suspension and steering?</p> <p>What are differences between leaf springs and coil springs?</p> <p>MacPherson struts and control arms suspensions?</p> <p>What are Pitman arms? Control arms?</p> <p>What is the primary role of shock absorbers in the suspension system?</p>	<ul style="list-style-type: none"> <li>▪ Explain the function of coil springs, leaf springs, and torsion bars</li> <li>▪ Explain the terms: twin "I" beams and Quadralinks</li> <li>▪ Explain the function of suspension bushings and shock absorbers</li> <li>▪ Define the roles of tie rod ends, ball joints and spindle bolts</li> <li>▪ Describe the difference between MacPherson struts and control arm suspension</li> <li>▪ Describe the difference between Pitman arms and control arms</li> <li>▪</li> </ul>	<p><b>Lab Exercise</b> Given proper textbook and repair manuals, explain the functions of the steering and suspension</p> <p><b>Group Exercise</b> Investigate the primary suspension components and design their own suspension system</p>	<p><b>Automotive Suspension Geometry and Mechanics PDF</b> <a href="http://multimechatronics.com/images/uploads/mech_n/Automotive_Suspension_Systems.pdf">http://multimechatronics.com/images/uploads/mech_n/Automotive_Suspension_Systems.pdf</a></p> <p><b>Understanding a Suspension System</b> You Tube 43 Suspension components <a href="https://www.youtube.com/watch?v=9nlaVjWeXsl">https://www.youtube.com/watch?v=9nlaVjWeXsl</a></p>

<p>Classify and explain the major automotive control systems specifically steering and braking.</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What is the difference between manual steering and power steering?</p> <p>Why is brake pedal height important?</p> <p>What are drum brakes? Disc brakes?</p> <p>What is the difference between manual brakes and power brakes?</p> <p>What are the hazards of leaking brake fluid? Steering fluid?</p> <p>What effects does heat have on brake fluids?</p>	<ul style="list-style-type: none"> <li>▪ Explain the function of a manual steering gear and the operation of power steering gears</li> <li>▪ Explain hydraulic principles as they apply to a hydraulic brake system</li> <li>▪ Explain the difference between integral and linkage type power steering</li> <li>▪ Explain the operation of rack and pinion gears</li> <li>▪ Explain the function of a power steering pump and problems that are caused by power steering fluid leakage</li> <li>▪ Describe the operation of drum brakes and describe the operation of automatic brake adjusters</li> <li>▪ Identify brake problems that can cause brake pull</li> </ul>	<p><b>Lab</b>                  Given proper textbook and repair manual, explain the primary brake components and associated brake problems. Identify the effects of heat and contamination on hydraulic fluids</p> <p><b>Inspection/Checklist</b>                  Outline in checklist format the proper procedure for checking brake linings</p> <p><b>Journal Entry</b>                  Document importance of maintaining proper steering and braking system maintenance</p>	<p><b>NHSTA</b>                  Safety laws and regulations for Private and company vehicles  <a href="http://www.nhtsa.gov/Laws+Regulations/Vehicles">http://www.nhtsa.gov/Laws+Regulations/Vehicles</a></p> <p><b>Publications.gov</b>                  How To Find Your Way Under The Hood &amp; Around The Car  <a href="http://publications.usa.gov/epublications/hoodcar/hoodcar.htm">http://publications.usa.gov/epublications/hoodcar/hoodcar.htm</a></p>
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		<ul style="list-style-type: none"> <li>brake chatter</li> <li>▪ Describe brake problems that cause brake pedal pulsations and brake fade</li> <li>▪ Explain proper brake pedal height</li> <li>▪ Explain the necessity for checking brake linings</li> </ul>		
<p>Demonstrate a knowledge of basic automotive engine cooling systems</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What is the function of the radiator? Thermostat?</p> <p>What is a water jacket?</p> <p>What is its role in automotive cooling?</p> <p>Why is it important to check and maintain belts and hoses?</p>	<ul style="list-style-type: none"> <li>▪ Explain the operation of a radiator</li> <li>▪ Explain the operation of an engine water jacket</li> <li>▪ Analyze the operation of a thermostat</li> <li>▪ Diagram the operation of a water pump</li> <li>▪ Illustrate the operation of a radiator cooling fan</li> <li>▪ Explain the operation of hoses and belts</li> </ul>	<p><b>Unit Test</b> Given proper study materials and information, pass a test covering automotive engine cooling systems.</p> <p><b>Poster/Art Exercise</b> Illustrate the flow of cooling fluids through the engine</p>	<p><b>Carparts.com</b> How does and automotive cooling system work <a href="http://www.carparts.com/classroom/coolingsystem.htm">http://www.carparts.com/classroom/coolingsystem.htm</a></p> <p><b>Engine Cooling System PDF</b> <a href="http://hillagric.ac.in/edu/cao/agengg/lecture/243/Lecture%207%20Cooling%20and%20lubrication.pdf">http://hillagric.ac.in/edu/cao/agengg/lecture/243/Lecture%207%20Cooling%20and%20lubrication.pdf</a></p>
<p>Demonstrate a knowledge of automotive heating and air</p>	<p>What are the primary components of the heating and cooling</p>	<ul style="list-style-type: none"> <li>▪ Explain operation of heater hoses and heater cores</li> </ul>	<p><b>Unit Test</b> Given proper study materials and information, pass a test</p>	<p><b>YouTube</b> How Car Cooling System Works <a href="https://www.youtube.com">https://www.youtube.com</a></p>



<p>conditioning systems</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p> <p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>system?</p> <p>How are the engines cooling system related to the interior heating and cooling system?</p> <p>What is Freon? What are the environmental concerns about Freon?</p> <p>What is a condenser? What is its primary function?</p> <p>What are flow control devices and valves? What role do they play in the cabin heating and cooling?</p>	<ul style="list-style-type: none"> <li>▪ Diagram operation of water control valves</li> <li>▪ Describe operation of electrical, vacuum and mechanical heater controls</li> <li>▪ Explain operation of air conditioning compressor and condenser</li> <li>▪ Define receiver-dryer, accumulators and evaporators</li> <li>▪ Explain operation of electrical and vacuum controls, switches, and wiring operation of controls, switches, high pressure and suction hoses</li> <li>▪ Explain temperature-pressure relationships of Freon 12 and safety precautions when handling Freon 12</li> </ul>	<p>covering automotive heating and air conditioning systems</p> <p><b>Inspection/Checklist</b> Outline in checklist format the proper procedure for checking hoses and fittings in cooling system</p>	<p><a href="#">/watch?v=-INZ2sRrsuo</a></p> <p><b>Engine Cooling System PDF</b> <a href="http://hillagric.ac.in/edu/oa/agengg/lecture/243/Lecture%207%20Cooling%20and%20lubrication.pdf">http://hillagric.ac.in/edu/oa/agengg/lecture/243/Lecture%207%20Cooling%20and%20lubrication.pdf</a></p>
<p>Establish a knowledge of automotive ignition and fuel system and potential hazards associated with</p>	<p>What are the primary components of the ignition and fuel system?</p> <p>What is a carburetor?</p>	<ul style="list-style-type: none"> <li>▪ List the components of an ignition system</li> <li>▪ List the components of a fuel system</li> <li>▪ Explain the operation</li> </ul>	<p><b>Poster</b> Create a poster outlining the safety precautions of handling combustibles like gasoline, in the lab</p>	<p><b>YouTube</b> Honda Motors Fuel System explained <a href="https://www.youtube.com/watch?v=Ei31evlvRcU">https://www.youtube.com/watch?v=Ei31evlvRcU</a></p>

<p>working on the systems  <b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6  <b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3  <b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>Injector? What is their primary function?</p>	<p>of the ignition system</p> <ul style="list-style-type: none"> <li>▪ Explain the operation of the fuel system</li> <li>▪ Define the precautions necessary when handling fuel in the lab</li> </ul>	<p><b>Unit Test</b>          Given a vehicle, textbook, repair manual, films, videos and slides, take a test that measures understanding of the ignition and fuel systems.</p>	<p><b>YouTube</b>          Fuel Injector Operation  <a href="https://www.youtube.com/watch?v=eVCYR4B7IZ8">https://www.youtube.com/watch?v=eVCYR4B7IZ8</a></p>
<p>Develop basic understanding of primary drive systems both manual and automatic  <b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6  <b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3  <b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>	<p>What are the primary differences between manual automatic transmissions? What are the primary components of each?          What is a transaxle?          Planetary gear system? What are their primary functions?          What is a U joint, yoke, single joint and slip joint? What are their primary functions?</p>	<ul style="list-style-type: none"> <li>▪ Explain differential operation</li> <li>▪ Explain limited slip mechanism</li> <li>▪ Define floating, 3/4 floating and semi-floating axles</li> <li>▪ Identify worn U joints</li> <li>▪ Identify slip joint, single joint</li> <li>▪ Explain constant velocity joint</li> <li>▪ Explain yoke and phase alignment</li> <li>▪ Explain torque converter function</li> <li>▪ Identify gears in the planetary gear system</li> </ul>	<p><b>Math Exercise</b>          Explain and diagram torque multiplication and gear ratios</p> <p><b>Unit Test</b>          Articulate through unit ending test primary differences between automatic and manual transmissions.</p>	<p><b>Illustrated Auto Glossary</b>  <a href="http://www.samarins.com/glossary/">http://www.samarins.com/glossary/</a></p> <p><b>Automotive Fuel Systems Explained</b>  <a href="http://web.archive.org/web/20100114004322/http://www.forgefx.com/casestudies/prenticehall/ph/engine/engine.htm">http://web.archive.org/web/20100114004322/http://www.forgefx.com/casestudies/prenticehall/ph/engine/engine.htm</a></p> <p><b>Auto Education</b>          Fuel System education  <a href="http://www.autoeducation.com/autoshop101/fuel.htm">http://www.autoeducation.com/autoshop101/fuel.htm</a></p>

		<ul style="list-style-type: none"> <li>▪ Identify the major components of the hydraulic system</li>   <li>▪ Explain the operation of the transaxle transmission</li> <li>▪ Explain how automatic transmission fluid cools and lubricates</li> <li>▪ Identify the major parts of the clutch</li> <li>▪ Explain engagement and disengagement</li> <li>▪ Identify mechanical, cable linkage and hydraulic linkage</li> </ul>		
<p>Demonstrate a knowledge of the internal combustion engine, both diesel and gasoline</p> <p><b>NJSLS:</b> 9.3.12.TD.3, 9.3.12.TD.2, 9.3.12.TD.6</p> <p><b>CCTC:</b> TD-MTN 02.1, TD-MTN 02.2, TD-HSE 1.1, TD-HSE 1.3</p>	<p>What are the 3 major systems involved in the gasoline combustion engine? Diesel Engine?</p> <p>What role does the camshaft and timing gear play in internal combustion engines?</p> <p>What are engine valves? What is their function?</p>	<ul style="list-style-type: none"> <li>▪ Explain the operation of the lubrication system</li> <li>▪ Explain the operation of the timing gear system</li> <li>▪ Diagram the operation of the valves</li> <li>▪ Define the operation of the piston assembly</li> </ul>	<p><b><u>Inspection/Checklist</u></b>            Outline in checklist format the proper procedure for checking hoses and fittings in the engine bay</p> <p><b><u>Venn Diagram</u></b>            Compare and contrast the operation of gasoline and diesel engines</p>	<p><b><u>Automated Engine video</u></b>  <a href="http://www.animatedengines.com/otto.html">http://www.animatedengines.com/otto.html</a></p> <p><b><u>Publications.gov</u></b>            How To Find Your Way Under The Hood &amp; Around The Car  <a href="http://publications.usa.gov/epublications/hoodcar/hoodcar.htm">http://publications.usa.gov/epublications/hoodcar/hoodcar.htm</a></p>

<p><b>CCSS:</b> RL.9-10.1; RI.9-10.5; SL.9-10.1</p>		<ul style="list-style-type: none"> <li>▪ Articulate the difference in the construction and operation of a diesel engine and a gasoline engine</li> </ul>	<p><b><u>Journal Entry</u></b>            Outline and enter the primary systems of Gasoline and diesel engines</p>	
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## Unit 3 Vocabulary

Lubricants  
 Classification  
 Solvent  
 Viscosity  
 Flat rate time  
 Tune-up  
 Vacuum  
 Emission  
 Evaporative  
 Electrical soldering  
 Soldering paste  
 Magnetism  
 Ohm's law  
 Breadboard  
 Resistor  
 Circuitry  
 Parallel circuits  
 Resistance  
 Toe in  
 Inclination  
 Coil springs  
 Leaf springs  
 Torsion bars  
 Quadralinks

Bushings  
 Tie rod  
 Ball joints  
 Spindle bolts  
 Control arm  
 Pitman arms  
 Pulsation  
 Differential  
 Proportioning  
 Thermostat  
 Accumulators  
 Evaporators  
 Freon  
 Semi-floating  
 U joints  
 Velocity joint  
 Yoke  
 Planetary gear  
 Transaxle  
 Linkage  
 Torque  
 Internal combustion  
 Diesel engine  
 Timing gear

## Suggested Unit Projects

*Choose At Least One*

**Poster/Diagram Exercise**

Develop and illustrate wiring diagram for basic parallel automotive electrical circuit

**Group Exercise**

Select Auto or Large Automotive component (Engine, Body) to rebuild for end of year project.

## Suggested Structured Learning Experiences

Wold Rides Race Cars Inc.  
 5138 West Hurley Pond Rd  
 Farmingdale, NJ 07727  
<https://wildridesracecars.com/about/>

New York International Auto Show  
 April 14-23 2017  
 JAVITS CENTER | 655 W. 34th St., New York, NY 10001  
<http://www.autoshowny.com/>

Lincoln Tech Diesel Heavy Equipment  
 901 Hadley Road  
 South Plainfield, NJ 07080  
 866-395-2433  
<http://southplainfield.lincolnedu-usa.com/oh/index.php>