Course: *Automotive Technology* **Unit #:** *Modern Automotive Systems - Unit 3*	**Year of Implementation:** 2024-2025

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
{provide all applicable links to standards here}
https://www.state.nj.us/education/cccs/2020/

- **Unit Standards:** *(keep each of the following headings in place)*
  - ***Content Standards***
    - 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.

  - ***21st Century Life & Career Standards***
    - 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
    - 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field.
    - 9.3.ST-ET.1 Use STEM concepts and processes to solve problems involving design and/or production.
    - 9.3.ST-ET.4 Apply the elements of the design process.

  - ***English Companion Standards***
    - RST.9-10.5. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
    - 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

- ***Interdisciplinary Content Standards***
  - N-Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
  - HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

- ***NJ Statutes:*** NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

  Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

  Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

  LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

  Diversity and Inclusion (N.J.S.A. 18A:35-4.36a) A board of education shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards.

  Asian American and Pacific Islanders (AAPI) P.L.2021, c.410 Ensures that the contributions, history, and heritage

of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416)

For additional information, see

NJ Amistad Curriculum: ***https://www.nj.gov/education/amistad/about/***

Diversity and Inclusion: ***https://www.nj.gov/education/standards/dei/index.shtml***

- *(Sample Activities/ Lessons):* ***https://www.nj.gov/education/standards/dei/samples/index.shtml***

Asian American and Pacific Islanders:

- ***Asian American and Pacific Islander Heritage and History in the U.S.***
  A Teacher's Guide from EDSITEment offering a collection of lessons and resources for K-12 social studies, literature and arts classrooms that center around the experiences, achievements and perspectives of Asian Americans and Pacific Islanders across U.S. history.

Transfer Goal: Students will be able to independently use their learning to develop a plan using the design process and implement a repair procedure in regards to modern vehicle systems.

As aligned with LRHSD Long Term Learning Goal(s):https://www.lrhsd.org/Page/6163

1. evaluate careers using critical thinking and problem-solving skills to respond to changing societal and economic conditions
2. acquire, integrate, and apply design processes and essential technical skills to solve problems, create products, and improve the quality of life for our local and global community

Enduring Understandings Students will understand that. . . *EU 1*	*Essential Questions*

● multiple systems work cohesively for a vehicle to operate safely and efficiently. *EU 2* ● vehicle diagnostics allow the maintenance of automotive systems to optimize vehicle operations and minimize premature wear	● How does a car get from A to B? ● How can you most efficiently repair a vehicle?
<u>Knowledge</u> *Students will know . . .* *EU 1* ● how to identify the cooling, lubrication, electrical, fuel, suspension, steering, brakes, drivetrain, and axle systems. (9.3.12.TD-MTN.2) *EU 2* ● how to maintain the cooling, lubrication, electrical, fuel, suspension, steering, brakes, drivetrain, and axle systems.(HS-ETS1-3) ● how to diagnose the cooling, lubrication, electrical, fuel, suspension, steering, brakes, drivetrain, and axle systems.(HS-ETS1-3)	*<u>Skills</u>* *Students will be able to. . .* *EU 1* ● diagram the major components of the cooling, lubrication, electrical, fuel, suspension, steering, brakes, drivetrain, and axle systems. ● explain the purpose of major systems and their parts. ● explain the relationship between the major systems. *EU 2* ● diagnose common vehicle system malfunctions. (9.3.ST-ET.4) ● explain service procedures for various systems. (9.3.ST.2) ● perform vehicle inspections using various diagnostic equipment. (9.3.ST-ET.4)

Stage Two - Assessment

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Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.** *{place A, M and/or T along with the applicable EU number in parentheses after each statement} All knowledge and skills must be addressed in this section with a corresponding lesson/activity which teaches each concept. The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy): Red = Interdisciplinary Connection; Purple = 21st Century Life & Career Connection*

- *Teacher led discussions on cooling and lubrication systems. (A)*
- *Use ProDemand software (M,T)*
- *Demonstration of…*
    - *an oil change. (A)*
    - *specialized cooling system tools (A)*
- *Videos on cooling and lubrication (A)*
- *Discuss environmental impact of recycling of hazardous materials (A, M)*
- *Discuss efficiency of cooling systems including air conditioning and the impact on society (A, M)*
- *Replace faulty cooling system components (T)*
- *Drain, flush, and refill a cooling system (T)*
- *Perform a compression test on a cooling system (T)*
- *Teacher led discussions on electrical and fuel systems. (A)*
- *Use ProDemand software (M,T)*
- *Student led discussion and demonstration of basic electrical tests (A, M)*
- *Discuss simple, series, parallel, and series-parallel circuits. (A)*
- *Practice soldering (M,T)*
- *Teacher demonstration of a battery service including charging a battery. (A)*
- *Teacher demonstration of spark plug change (A)*
- *Teacher demonstration of diagnosing and replace a malfunctioning starter (A)*
- *Teacher demonstration on alternator output (A)*
- *Teacher demonstration on changing lighting units (A)*

- *Teacher demonstration of specialized electrical system tools (A)*
- *Videos (YouTube.com) on battery recycling, how a battery is made, how a charging system works, how to rebuild an alternator (A)*
- *Discuss environmental impact of recycling of hazardous materials (A, M)*
- *Discuss fuels such as gasoline, diesel, and alternative sources (A)*
- *Teacher demonstration of fuel filter change (A)*
- *Teacher demonstration of fuel pump replacement (M, T)*
- *Discussion of fuel injection and carburation (A)*
- *Teacher demonstration of servicing a carburetion system (M)*
- *Videos on fuel injection and carburetors (A)*
- *Teacher led discussions on suspension systems. (A)*
- *Teacher led discussions steering systems. (A)*
- *Teacher led discussions on brake systems. (A)*
- *Teacher demonstration of multiple manufactured brake systems (A)*
- *Student demonstration on how to disassemble and reassemble brake systems from various manufacturers. (M,T)*
- *Use ProDemand software. (M,T)*
- *Videos on suspension, steering, and brake systems which can be found on youtube.com. (A)*
- *Teacher/ Student demonstration of diagnosis and replacement of suspension components. (A,M,T)*
- *Teacher/ Student demonstration of diagnosis and replacement of steering components. (A,M,T)*
- *Teacher/ Student demonstration of diagnosis and replacement of brake components. (A,M,T)*
- *Explain static and dynamic wheel balance (A,M)*
- *Teacher/ Student demonstration of wheel and tire balancing (A,M,T)Teacher led discussions on clutch systems. (A)*
- *Teacher led discussions on manual and automatic transmissions. (A)*
- *Teacher led discussions on driveshafts. (A)*
- *Teacher led discussions on transfer cases and transaxles. (A)*
- *Teacher led discussion on differentials and axles. (A)*
- *Videos on drivetrains which can be found on youtube.com. (A)*
- *Teacher/ Student demonstration of diagnosis and replacement of drivetrain components. (A,M,T)*
- *Teacher/ Student demonstration on transmission, differential, and transfer case maintenance. (A,M,T)*
- *Teacher/ Student demonstration of a manual transmission operation. (A,M,T)*
- *Teacher/ Student demonstration on seal and gasket replacements on transmission and differentials. (A,M,T)*
- *Teacher/ Student demonstration of removal and replacement of cv joint (A,M,T)*

Pacing Guide

{This chart will be identical in all of the units for this course.}

Unit #	***Title of Unit***	***Approximate # of teaching days***
1	*Safety, Equipment and Measuring*	30
2	*Internal Combustion Engine*	30
3	*Modern Automotive Systems*	75

Instructional Materials

- *Modern Automotive Technology 9th Edition, Goodheart-Wilcox*
- *Pro Demand Software*
- *OBD scan tools*
- *Shop vehicle*
- *Tire Changer*
- *Tire Balancer*
- *Hunter Alignment Machine*
- *Advanced Driver Assist Link and Sensor Board*
- *Shop Vehicle*
- *Calipers*
- *Micrometers*
- *Temperature gauges*
- *Pressure gauges*
- *Vacuum gauges*
- *Fuel gauges*

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Accommodations

Special Education: The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.
Students with 504 Plans: Students will be accommodated based on specific accommodations listed in the 504 Plan.
English Language Learners: Students will be accommodated based on individual need and in consultation with the ELL teacher.
Students at Risk of School Failure: Students will be accommodated based on individual need and provided various structural supports through their school.
Gifted and Talented Students: Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.