AUTOMOTIVE TECHNOLOGY II

Course # 1091

Credits 12.5

September 2017

I. COUSE DESCRIPTION:

Passaic County Technical Institute's automotive program is a National Automotive Technicians Educational Foundation (NATEF) Certified program, which offers students instruction in all the basic areas of automotive technology. It provides a sound educational building foundation for the students with a strong interest in the automotive industry including a description of trade requirements and an insight into the automotive employment opportunities. Occupational and personal safety and health will be emphasized at all levels. The contents of level II are the Electrical System including meter usage and circuit diagnosis, battery systems, starting and charging systems, lighting systems and body electric systems; Engine Repair including motive types, mechanical testing, engine lubrication and engine cooling; and Brakes including the principles of braking, hydraulics and power brakes, disc brake systems, drum brake systems, wheel bearings and electronic brake control. Automotive Technology II is the first of three full year courses that will follow National Institute for Automotive Service Excellence (ASE), Maintenance and Light Repair (MLR) training program. A minimum of 540 hours of combined classroom and lab/on-vehicle service and repair activities will be completed by the end of the fourth year. Additionally, NATEF policy on its task list serves as a basis for course completion. Which is: Ninety-five percent (95%) of Priority 1 (P-1); eighty percent (80%) of Priority 2 (P-2); and fifty percent (50%) of Priority 3 (P-3) will be taught. The task-based curriculum teaches industry standards so that the student can have a smooth transition to the work environment.

The students will perform routine scheduled maintenance services to the vehicles. On-vehicle service and repair work is scheduled to benefit the students and supplement ongoing instruction on items specified in the NATEF task list. Students will have had instruction and practice on specific repair tasks prior to on-vehicle service and repair work. The primary source of on-vehicles for service and repair will include but not limited to vehicles donated by manufacturers, customer-owner vehicles, training student-owner vehicles and other vehicles. Industry-type completed work orders will be on or attached to all vehicles to be serviced.

II UNITS:

UNIT 1

Content Area:	**AUTOMOTIVE TECHNOLOGY II**	**Grade(s)**	**10**
Unit Plan Title:	**SAFETY**		

NJSLS/CCTC Standard(s) Addressed in this unit

8.1.5. E.1a Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.
9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.5 Apply knowledge in Stem to solve problems
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence

Essential Questions (3-5)

Why is it important to follow safe practices in the workplace?
How does the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) impact the workplace?
What is the difference between a shop policy and a shop procedure?
How do shop policies, procedures, and safety inspections make the workplace safer and how are Safety Data Sheets (SDS) used?
How are hazardous environments identified and what safety precautions should be taken in hazardous environments?
What are some common workplace safety signs and what are their meanings?
What are some standard safety equipment items that should be in the workplace?
How is a safe level of air quality in the workplace maintained and how is toxic dust managed ?
What are some safety precautions to be taken when working with electrical tools and equipment?
How can the shop layout contribute to efficiency and safety?
How can the risk of fires in shop be reduced and how is firefighting equipment used
How is engine oil and fluids properly managed?

Anchor Text

Fundamentals of Automotive Maintenance and Light Repair, by Kirk T. VanGelder and Ian W. Andrew, Jones & Bartlett, Burlington, MA, 01803, 2015, ISBN# 978-1-284-05673-0

Fundamentals of Automotive Maintenance and Light Repair Student Workbook, Kirk T. VanGelder, Jones & Bartlett, Burlington, MA, 01803, 2016, ISBN# 978-1-284-07783-4

Fundamentals of Automotive Maintenance and Light Repair Tasksheet Manual for NATEF Proficiency, Kirk T. VanGelder, Jones & Bartlett, Burlington, MA, 01803, 2016, ISBN# 978-1-284-07785-8

Short & Informational Texts (3-5)

Modern Automotive Technology 8th edition, by James E. Duffy, The Goodheart-Willcox Company, Inc., Tinley Park, IL., 2014, ISBN# 978-1-61960-370-7

Auto Upkeep: Basic Car Care, Maintenance, and Repair 3rd Edition, by Michael E. Gray and Linda E. Gray, Rolling Hills Publishing , Ozark Missouri, 2013, ISBN# 978-1-62702-006-0

Auto Upkeep: Basic Car Care, Maintenance, and Repair Workbook 3rd Edition, by Michael E. Gray and Linda E. Gray, Rolling Hills Publishing , Ozark Missouri, 2013, ISBN# 978-1-62702-002-2
Expected Proficiencies of the Unit
Shop and Personal Safety: Identify general shop safety rules and procedures. Utilize safe procedures for handling of tools and equipment. Identify and use proper placement of floor jacks and jack stands. Identify and use proper procedures for safe lift operations. Utilize proper ventilation procedures for working within the lab/shop area. Identify marked safety areas. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment. Identify the locations of eyewash stations. Identify the locations of the posted evacuation routes. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities. Identify and wear appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.). Locate and demonstrate knowledge of material data sheets (MSDS).
Formative & Summative Assessments
Formative: quizzes ,task sheets completion, homework, CDX on-line pre and post module assessments Summative: Tests both written and performance
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
www.SP2.org/site/page/automotive
Suggested Time Frame: 1 Week

UNIT 2

Content Area:	ENGINE MECHANICS II	Grade(s)	10
Unit Plan Title:	Electrical/ Electronics		

NJSLS/CCTC Standard(s) Addressed in this unit

8.1.5. E.1a Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.

9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.

9.3.ST-ET.5 Apply knowledge in Stem to solve problems

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence

Essential Questions (3-5)

What are the basic principles of electricity and the units of voltage, resistance, and current flow?
What are semiconductors and how do they work?
What is the difference between AC and DC current; series and parallel circuits?
What is Ohm's law and power law and how is it used in basic calculations to determine circuit parameters that may be out of balance?
What is the process used to locate a short circuit in an electrical/electronic system?
What is the role of a fuse or fusible link as a protective device in an electrical or electronic circuit?
How are conventional symbols (E for voltage, etc.) used to solve problems using formulas such as Ohm's law, E=IR?
How does the role of specific gravity assist in determining the condition of the battery system?
How are conductivity problems in a circuit explained when connectors corrode due to electrochemical reactions?
What is the role of the generator/alternator in maintaining battery and system voltage; and what is the system voltage generation, its uses, and its characteristics?
What is the system voltage generation, its uses, and its characteristics?
What are the correct procedure to measure the electrical parameters of voltage, current, and resistance; and how is the electrical current and voltage in a circuit correctly measured?

Anchor Text

Fundamentals of Automotive Maintenance and Light Repair, by Kirk T. VanGelder and Ian W. Andrew, Jones & Bartlett, Burlington, MA, 01803, 2015, ISBN# 978-1-284-05673-0

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Modern Automotive Technology 8th edition, by James E. Duffy, The Goodheart-Willcox Company, Inc., Tinley Park, IL., 2014, ISBN# 978-1-61960-370-7

Expected Proficiencies of the Unit

ELECTRICAL/ELECTRONIC SYSTEMS

For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General

1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Use wiring diagrams to trace electrical/electronic circuits. P-1
4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1
5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
6. Use a test light to check operation of electrical circuits. P-2
7. Use fused jumper wires to check operation of electrical circuits. P-2
8. Measure key-off battery drain (parasitic draw). P-1
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
10. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair) P-1

11. Identify electrical/electronic system components and configuration.	P-1
VI. ELECTRICAL/ELECTRONIC SYSTEMS	
B. Battery Service	
1. Perform battery state-of-charge test; determine necessary action.	P-1
2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action.	P-1
3. Maintain or restore electronic memory functions.	P-1
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
5. Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
7. Identify safety precautions for high voltage systems on electric, hybrid-electric, and diesel vehicles.	P-2
8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P-1
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
VI. ELECTRICAL/ELECTRONIC SYSTEMS	
C. Starting System	
1. Perform starter current draw test; determine necessary action.	P-1
2. Perform starter circuit voltage drop tests; determine necessary action.	P-1
3. Inspect and test starter relays and solenoids; determine necessary action.	P-2
4. Remove and install starter in a vehicle.	P-1
5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.	P-2
6. Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-3
VI. ELECTRICAL/ELECTRONIC SYSTEMS	
D. Charging System	
1. Perform charging system output test; determine necessary action.	P-1

2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
3. Remove, inspect, and/or replace generator (alternator).	P-2
4. Perform charging circuit voltage drop tests; determine necessary action.	P-2
VI. ELECTRICAL/ELECTRONIC SYSTEMS	
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems	
1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
2. Aim headlights.	P-2
3. Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
4. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
5. Remove and reinstall door panel.	P-1
6. Describe the operation of keyless entry/remote-start systems.	P-3
7. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.	P-1
8. Verify windshield wiper and washer operation; replace wiper blades.	P-1

EE Tasks	
P-1	26
P-2	10
P-3	2
	38

Formative & Summative Assessments

Formative: quizzes ,task sheets completion, homework, CDX on-line pre and post module assessments

Summative: Tests both written and performance

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

www.SP2.org/site/page/automotive

Suggested Time Frame:	12 weeks

UNIT 3

Content Area:	AUTOMOTIVE TECHNOLOGY II	Grade(s)	10
Unit Plan Title:	Engine Repair		

NJSLS/CCTC Standard(s) Addressed in this unit

8.1.5. E.1a Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.
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9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.
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3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence

Essential Questions (3-5)

What are the differences between external combustion engines and internal combustion engines; and what are the five events common to all external combustion engine?
What are the relationships between pressure, temperature, and volume?
What is force, work and power?
What is the difference between reciprocating and rotary motion?
What are the functions of the cylinder head? What are the differences between a cam-in-block engine and overhead cam (OHC) engines?
How does the camshaft operate?
How does the valve train function?
What are the intake and exhaust manifolds?
What are the tools required for engine testing; and what are the basic principles of engine mechanical testing?
What are the types and causes of fluid leaks in engines?
What are factors involved in a cranking sound diagnosis?
What is vacuum testing and how can it be used to determine the engine's general condition?
How does one conduct a cylinder power balance test?
What are the factors involved in cranking and running compression tests; and what are the principles of the cranking compression test?
What are the factors involved in a cylinder leakage test?
What are the variety of noises and vibrations and vibrations that a running engine creates?
How can the consumption of oil or coolant not located due to visual leaks may be determined by the color of the exhaust?
What is the difference between torque and horsepower? In addition, how does torque relate to force and angular acceleration?
How can rotational motion be converted to liner motion and why is the balance important in rotating systems?
How can using ultraviolet light used to determine the source of leakage?
Why are dyes added to lubricants fluoresce in ultraviolet light?
How can scientific terms be related to automotive system diagnosis, services, and repair?

Anchor Text

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Expected Proficiencies of the Unit

I. ENGINE REPAIR

A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Verify operation of the instrument panel engine warning indicators. P-1
3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
4. Install engine covers using gaskets, seals, and sealers as required. P-1
5. Verify engine mechanical timing. P-2
6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
7. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle. P-2

I. ENGINE REPAIR

B. Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters). P-3
2. Identify components of the cylinder head and valve train. P-1

I. ENGINE REPAIR

C. Lubrication and Cooling Systems

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine necessary action.	P-1
2. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
3. Remove, inspect, and replace thermostat and gasket/seal.	P-1
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
5. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.	P-1
6. Identify components of the lubrication and cooling systems.	P-1

ER Tasks	
P-2	2
P-3	1
P-3	1
	15

Formative & Summative Assessments
Formative: quizzes ,task sheets completion, homework, CDX on-line pre and post module assessments Summative: Tests both written and performance
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
www.SP2.org/site/page/automotive
Suggested Time Frame: 11 weeks

UNIT 4

Content Area:	AUTOMOTIVE TECHNOLOGY II	Grade(s)	10
Unit Plan Title:	Brakes		

NJSLS/CCTC Standard(s) Addressed in this unit

8.1.5. E.1a Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.
9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.5 Apply knowledge in Stem to solve problems
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence

Essential Questions (3-5)

What factors can influence vehicle braking and how has braking systems evolved from scrub brakes to brake- by- wire systems?
What are the principles of kinetic energy, Newton's first law of motion, conservation of energy, and friction? How do they apply to the brake system?
Why does the brake system need to account for heat transfer?
What is rotational force and weight transfer?
What are the scientific principles behind a working brake pedal?
What are the types of brake systems and describe how they operate?
What are the principles of hydraulic pressure and force and how do they apply to the hydraulic braking system?
What is the role of brake fluid in a hydraulic braking system?
What is the purpose of the master cylinder; and how does it operate within the hydraulic braking system?
How are the principles of the cranking compression test?
What is the purpose of break line and hoses; and how are the inspected and replaced?
How does a proportioning valve operate and what is the purpose of a metering valve and pressure differential valve and how does it operate?
What are the types of power brakes and how does a vacuum booster operate?
What are some of the common questions to ask a customer during a diagnosis of a fault in the hydraulic braking system?
What is the principle of the coefficient of friction and how does it affect brake lining materials?
What is the procedure to measure a disk brake rotor?
What is the principle of self- energization?
What is the basic principles of operation of the anti-lock brake system?
What are the basic principles of operation of electronic stability control and traction control systems?

Anchor Text

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Expected Proficiencies of the Unit

BRAKES

For every task in Brakes, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

V. BRAKES

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1
3. Install wheel and torque lug nuts. P-1
4. Identify brake system components and configuration. P-1

V. BRAKES

B. Hydraulic System

1. Describe proper brake pedal height, travel, and feel. P-1
2. Check master cylinder for external leaks and proper operation. P-1
3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports. P-1

4. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
5. Identify components of hydraulic brake warning light system.	P-3
6. Bleed and/or flush brake system.	P-1
7. Test brake fluid for contamination.	P-1
V. BRAKES	
C. Drum Brakes	
1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
2. Refinish brake drum and measure final drum diameter; compare with specification.	P-1
3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-1
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.	P-1
V. BRAKES	
D. Disc Brakes	
1. Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action.	P-1
2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1
3. Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.	P-1
4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.	P-1
5. Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.	P-1
6. Remove and reinstall/replace rotor.	P-1

7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
9. Retract and re-adjust caliper piston on an integral parking brake system.	P-2
10. Check brake pad wear indicator; determine necessary action.	P-1
11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation.	P-1
V. BRAKES	
E. Power-Assist Units	
1. Check brake pedal travel with, and without, engine running to verify proper power booster operation.	P-2
2. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1
V. BRAKES	
F. Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical)	
1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-1
2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-2
3. Check parking brake operation and parking brake indicator light system operation; determine necessary action.	P-1
4. Check operation of brake stop light system.	P-1
5. Replace wheel bearing and race.	P-2
6. Inspect and replace wheel studs.	P-1
V. BRAKES	
G. Electronic Brake, Traction Control, and Stability Control Systems	
1. Identify traction control/vehicle stability control system components.	P-3
2. Describe the operation of a regenerative braking system.	P-3

BR Tasks	
P-1	29
P-2	5
P-3	3
	37

Formative & Summative Assessments
Formative: quizzes ,task sheets completion, homework, CDX on-line pre and post module assessments Summative: Tests both written and performance
Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)
www.SP2.org/site/page/automotive

Suggested Time Frame:	11 Weeks

III. Instructional Strategies

The Automotive Department incorporates an Experiential Learning Environment simulating a modern automotive dealership. Teacher examples of work ethics and habits, cooperative learning and teacher evaluation accent classroom lessons. Lectures are reinforced with the use of web-based automotive curricula; smartboards, modern testing and diagnostic equipment, vehicle components and actual vehicles supplement and enhance classroom instruction. Reinforcement of lessons are complemented with active student participation in a functioning automotive repair lab. Students are expected to demonstrate proficiency of associated NATEF Task lists as well as effective communication skills incorporating applied academics such as science, technology, language arts, analytical and math skills as tasks are completed.

IV. Scope and Sequence:

SAFETY
ELECTRICAL/ELECTRONIC SYSTEMS
A. General
B. Battery Service
C. Starting System
D. Charging System

E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
ENGINE REPAIR
A. General
B. Cylinder Head and Valve Train
C. Lubrication and Cooling Systems
BRAKES
A. General
B. Hydraulic System
C. Drum Brakes
D. Disc Brakes
E. Power-Assist Units
F. Related Systems (i.e. Wheel Bearings, Parking Brakes, and Electrical)
G. Electronic Brake, Traction Control, and Stability Control Systems

V. Complete List of Course Textbooks, Instructional Resources & Software

Fundamentals of Automotive Maintenance and Light Repair, by Kirk T. VanGelder and Ian W. Andrew, Jones & Bartlett, Burlington, MA, 01803, 2015, ISBN# 978-1-284-05673-0

Fundamentals of Automotive Maintenance and Light Repair Student Workbook, Kirk T. VanGelder, Jones & Bartlett, Burlington, MA, 01803, 2016, ISBN# 978-1-284-07783-4

Fundamentals of Automotive Maintenance and Light Repair Tasksheet Manual for NATEF Proficiency, Kirk T. VanGelder, Jones & Bartlett, Burlington, MA, 01803, 2016, ISBN# 978-1-284-07785-8

Auto Upkeep: Basic Car Care, Maintenance, and Repair 3rd Edition, by Michael E. Gray and Linda E. Gray, Rolling Hills Publishing , Ozark Missouri, 2013, ISBN# 978-1-62702-006-0

Auto Upkeep: Basic Car Care, Maintenance, and Repair Workbook 3rd Edition, by Michael E. Gray and Linda E. Gray, Rolling Hills Publishing , Ozark Missouri, 2013, ISBN# 978-1-62702-002-2

Modern Automotive Technology 8th edition, by James E. Duffy, The Goodheart-Willcox Company, Inc., Tinley Park, IL., 2014, ISBN# 978-1-61960-370-7

VI. Student Handout:

Course Description

Passaic County Technical Institute's automotive program is a National Automotive Technicians Educational Foundation (NATEF) Certified program, which offers students instruction in all the basic areas of automotive technology. It provides a sound educational building foundation for the students with a strong interest in the automotive industry including a description of trade requirements and an insight into the automotive employment opportunities. Occupational and personal safety and health will be emphasized at all levels. The contents of level II are the Electrical System including meter usage and circuit diagnosis, battery systems, starting and charging systems, lighting systems and body electric systems; Engine Repair including motive types, mechanical testing, engine lubrication and engine cooling; and Brakes including the principles of braking, hydraulics and power brakes, disc brake systems, drum brake systems, wheel bearings and electronic brake control. Automotive Technology II is the first of three full year courses that will follow National Institute for Automotive Service Excellence (ASE), Maintenance and Light Repair (MLR) training program. A minimum of 540 hours of combined classroom and lab/on-vehicle service and repair activities will be completed by the end of the fourth year. Additionally, NATEF policy on its task list serves as a basis for course completion. Which is: Ninety-five percent (95%) of Priority 1 (P-1); eighty percent (80%) of Priority 2 (P-2); and fifty percent (50%) of Priority 3 (P-3) will be taught. The task-based curriculum teaches industry standards so that the student can have a smooth transition to the work environment.

The students will perform routine scheduled maintenance services to the vehicles. On-vehicle service and repair work is scheduled to benefit the students and supplement ongoing instruction on items specified in the NATEF task list. Students will have had instruction and practice on specific repair tasks prior to on-vehicle service and repair work. The primary source of on-vehicles for service and repair will include but not limited to vehicles donated by manufacturers, customer-owner vehicles, training student-owner vehicles and other vehicles. Industry-type completed work orders will be on or attached to all vehicles to be serviced.

Proficiencies

A. Apply orientation procedures and shop rule
B. Develop proper attitudes concerning safety in the automotive shop and practice safety rules.
C. Properly use shop hand tools, power tools and specialized equipment appropriate for this level of instruction.
D. Apply service and diagnostic procedures using all types of conventional automotive fasteners.
E. Acquire an understanding of how to utilize and locate information found in automotive service manuals, including CD-ROM based information such as ALLDATA.

F. Acquire an understanding of how to properly fill out an automotive repair order.
G. Perform all types of lubrications on automobiles including the proper identification of each type.
H. Diagnose and service various types of wheel and tires found on domestic and foreign vehicles.
I. Indicate a basic understanding of test equipment including, battery, charging system tester, digital volt ohmmeter, and a test light.
J. Diagnose and service different types of cooling systems including identification and functions of each component.
K. Describe and explain basic fuel injection theory.
L. Identify and make service repairs on various types of exhaust systems.
M. Describe and explain basic engine theory.
N. Diagnose and service domestic and foreign engines.
O. Acquire an understanding of how to read and use a micrometer.
P. Describe and explain the brake system theory.
Q. Diagnose and service various types of brakes found on today's vehicles.