

AUTOMOTIVE TECHNOLOGY III

Course # 1092

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. Automotive Technology III is the second of three full year courses that will follow National Institute for Automotive Service Excellence (ASE), Maintenance and Light Repair (MLR) training program. Instruction during this year will comprise the following: a review of safety, Steering and Suspension, Auto Transmissions, and Manual Transmissions. 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. UNIT PLANS:

UNIT 1

| | | | |
|---|----------------------------------|-----------------|-----------|
| Content Area: | AUTOMOTIVE TECHNOLOGY III | Grade(s) | 11 |
| Unit Plan Title: | Safety | | |
| NJSLS/CCTC Standard(s) Addressed in this unit | | | |
| <p>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.</p> <p>9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.</p> <p>9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.</p> <p>9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.</p> <p>9.3.ST-ET.5 Apply knowledge in Stem to solve problems</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> | | | |

- 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 and how do shop policies, procedures, and safety inspections make the workplace safer ?
- 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 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 are Safety Data Sheets (SDS) used?
- How is engine oil and fluids properly managed?
- What is the proper use and procedures for safe lift operations?
- What is the proper use and placement of floor jacks and jack stands?
- What are and does one properly use fender covers and floor mats?
- How are vehicles properly prepared for customer pickup?

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)

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

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

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|----------------------|----------------------------------|-----------------|-----------|
| Content Area: | AUTOMOTIVE TECHNOLOGY III | Grade(s) | 11 |
|----------------------|----------------------------------|-----------------|-----------|

| | |
|-------------------------|----------------------------|
| Unit Plan Title: | Steering Suspension |
|-------------------------|----------------------------|

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 components that compose a vehicle's wheel; and what are the principles of tire distortion, center of gravity, and wheel offset?
- What are the different types of tire construction?
- How does one decipher the tire markings on the sidewall of a tire?
- What are some of the common safety features found on today's tires and what are the components of a standard preventive tire service program?
- What are the common tire and wheel issues that a driver may experience?
- How does one use standard and metric measurement instruments to determine correct sizes and distances?
- What are the components of the basic steering system; and what are the different types of steering boxes and how do they function?
- What is the purpose and types of power steering?
- What tools are used in proper diagnostics of steering systems; and how is steering system properly maintained?
- How might problem symptoms relate to the probability of the malfunction of a specific part or system?
- How does the suspension system operate; and what is the principle of suspension force and how does it affect the suspension system?
- What are the principles of unsprung weight and dampening?
- How does wheel unit location relate to the suspension system; and what is yaw, pitch, and roll as they relate to vehicles?
- What are solid axle and live axle types of suspension and how do they function?
- What are independent and rear suspension and how do they work?
- What are the fundamentals and the four basic types of wheel alignment?
- What measurement devices are used to determine the parallelism or perpendicularity of chassis, suspension, and other vehicle systems?
- How is a tension gauge such as a torque wrench used to measure force or tension required to tighten connections to manufacturer's specifications?
- How does circular motion relate to toe and camber on turns?
- What are the forces and motions in pneumatic systems?

Anchor Text

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Expected Proficiencies of the Unit

SUSPENSION AND STEERING

For every task in Suspension and Steering, 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.

IV. SUSPENSION AND STEERING SYSTEMS

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.

P-1

2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.

P-1

3. Identify suspension and steering system components and configurations. P-1

IV. SUSPENSION AND STEERING

B. Related Suspension and Steering Service

1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-1
2. Inspect power steering fluid level and condition. P-1
3. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification. P-2
4. Inspect for power steering fluid leakage. P-1
5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1
6. Inspect and replace power steering hoses and fittings. P-2
7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-1
8. Inspect tie rod ends (sockets), tie rod sleeves, and clamps. P-1
9. Inspect upper and lower control arms, bushings, and shafts. P-1
10. Inspect and replace rebound bumpers. P-1
11. Inspect track bar, strut rods/radius arms, and related mounts and bushings. P-1
12. Inspect upper and lower ball joints (with or without wear indicators). P-1
13. Inspect suspension system coil springs and spring insulators (silencers). P-1
14. Inspect suspension system torsion bars and mounts. P-1
15. Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-1
16. Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings. P-2
17. Inspect front strut bearing and mount. P-1
18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. P-1
19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1
20. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1
21. Inspect electric power steering assist system. P-2
22. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2
23. Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control). P-3

IV. SUSPENSION AND STEERING

C. Wheel Alignment

- 1. Perform prealignment inspection; measure vehicle ride height. P-1
- 2. Describe alignment angles (camber, caster and toe) P-1

IV. SUSPENSION AND STEERING

D. Wheels and Tires

- 1. Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label. P-1
- 2. Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS). P-1
- 3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. P-1
- 4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-1
- 5. Inspect tire and wheel assembly for air loss; determine necessary action. P-1
- 6. Repair tire following vehicle manufacturer approved procedure. P-1
- 7. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps. P-1
- 8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure. P-1

| SS Tasks | |
|-----------------|----|
| P-1 | 29 |
| P-2 | 6 |
| P-3 | 1 |
| | 36 |

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 III | Grade(s) | 11 |
| Unit Plan Title: | Auto Transmissions | | |
| NJSLS/CCTC Standard(s) Addressed in this unit | | | |
| <p>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.</p> <p>9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.</p> <p>9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.</p> <p>9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.</p> <p>9.3.ST-ET.5 Apply knowledge in Stem to solve problems</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence</p> | | | |

Essential Questions (3-5)

What are the principles of operation of the automatic transmission; and what are the principles of the torque converter?

What is the basic operation of the planetary gear sets? How is the use of fractions, decimals, ratios, and percentages used in problem solving?

What are the different common components of the automatic transmission?

How does one diagnose the fluid loss and condition concerns while servicing an automatic transmission; and how are the fluid and internal filter replaced in an automatic transmission?

What is the procedure for inspecting for leaks and replacing external seals, gaskets, and bushings?

How are power train mounts inspected, replaced, and aligned?

How does the hybrid drive system work; and how does the hybrid and the hybrid electric vehicles compare?

How does a continuously variable transmission (CVT) work; and how does the operation of the electronic continuously variable transmission (ECVT) and the variable-diameter pulley CVT differ?

How can cams, pulleys, and levers be used to multiply forces or change the direction in a mechanical system?

Anchor Text

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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

Expected Proficiencies of the Unit

AUTOMATIC TRANSMISSION AND TRANSAXLE

For every task in Automatic Transmission and Transaxle, 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.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1
3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1
4. Check transmission fluid condition; check for leaks. P-2
5. Identify drive train components and configuration. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2
2. Inspect for leakage at external seals, gaskets, and bushings. P-1
3. Inspect, replace and/or align power train mounts. P-2
4. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1

C. Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
2. Describe the operational characteristics of a hybrid vehicle drive train. P-3

| AT Tasks | |
|----------|----|
| P-1 | 6 |
| P-2 | 3 |
| P-3 | 2 |
| | 11 |

| 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 III | Grade(s) | 11 |
|---|----------------------------------|-----------------|-----------|
| Unit Plan Title: | Manual Transmissions | | |
| NJSLS/CCTC Standard(s) Addressed in this unit | | | |
| <p>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.</p> <p>9.3. ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.</p> <p>9.3.ST.3 Describe the following safety, health, and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.</p> <p>9.3ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.</p> <p>9.3.ST-ET.5 Apply knowledge in Stem to solve problems</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> | | | |

- 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.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence

Essential Questions (3-5)

- What is the principle of mechanical advantage; and what is the meaning of gear ratio?
- What is the trade-off between mechanical advantage and the rotational speed of gears; and how does one calculate the gear ratio of a given set of gears?
- What is the principle of power flow; and what is the purpose of the drive train, its operation, and components?
- What are a spur and helical gears?
- What are radial and axial loads?
- What is purpose of the clutch
- What is the purpose of the transfer case?
- What is the purpose of the final drive and differential assembly?
- What is the difference between a live axle and a dead axle?
- Describe preventive maintenance and what is the importance of lubrication?
- What is the purpose and operation of the clutch; and what is the purpose and operation of each of the major components of the clutch?
- What is the difference between the standard flywheel and a dual mass flywheel?

Anchor Text

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Expected Proficiencies of the Unit

MANUAL DRIVE TRAIN AND AXLES

For every task in Manual Drive Train and Axles, 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.

III. MANUAL DRIVE TRAIN AND AXLES

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. P-1
3. Check fluid condition; check for leaks. P-2
4. Identify manual drive train and axle components and configuration. P-1

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch

1. Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification P-1

2. Check for hydraulic system leaks. P-1

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-2

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel drive)

1. Inspect, remove, and/or replace bearings, hubs, and seals. P-2

2. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. P-2

3. Inspect locking hubs. P-3

4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2

III. MANUAL DRIVE TRAIN AND AXLES

E. Differential Case Assembly

1. Clean and inspect differential case; check for leaks; inspect housing vent. P-1

2. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification. P-1

3. Drain and refill differential housing. P-1

4. Inspect and replace drive axle wheel studs. P-1

| MD Tasks | |
|----------|----|
| P-1 | 9 |
| P-2 | 5 |
| 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: 12 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

IV. SUSPENSION AND STEERING SYSTEMS

A. General

IV. SUSPENSION AND STEERING

B. Related Suspension and Steering Service

IV. SUSPENSION AND STEERING

C. Wheel Alignment

IV. SUSPENSION AND STEERING

D. Wheels and Tires

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle

C. Off-Vehicle Transmission and Transaxle

III. MANUAL DRIVE TRAIN AND AXLES

A. General

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel drive)

III. MANUAL DRIVE TRAIN AND AXLES

E. Differential Case Assembly

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. Automotive Technology III is the second of three full year courses that will follow National Institute for Automotive Service Excellence (ASE), Maintenance and Light Repair (MLR) training program. Instruction during this year will comprise the following: a review of safety, Steering and Suspension, Auto Transmissions, and Manual Transmissions. 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:

Upon successful completion of the requirements of this course, the student will be able to:

- A. Apply orientation procedures and shop rules.

- B. Develop proper attitudes concerning safety in the automotive shop and practice safety rules.
- C. Properly use common shop tools and related equipment.
- D. Apply and demonstrate proper use of service manuals including On-line based ALLDATA and Identifix.
- E. Apply and demonstrate proper procedure for filling out a vehicle repair order.
- F. Demonstrate engine theory and knowledge of engine operation.
- G. Demonstrate fuel injection theory and knowledge of operation.
- H. Demonstrate brake theory and knowledge of brake operation.
- I. Perform lubrication of an automobile including identification of lubricants used.
- J. Analyze purpose, and operation of steering and suspension systems.
- K. Diagnose and service wheels and tires.
- L. Diagnose and service steering systems.
- M. Diagnose and service suspension systems.
- N. Acquire an understanding of the basic principles of performing a four-wheel alignment.
- O. Identify and discuss the operation of the Hunter four-wheel alignment equipment.
- P. Demonstrate proper use of test equipment including, Sun Vat 45, test light, and digital volt ohmmeter.
- Q. Describe and explain basic electrical/electronic theory.
- R. Identify various wiring circuit's schematics and their symbols including testing and use of meters.
- S. Describe and explain starter and charging theory.
- T. Diagnose and service batteries, alternators and starters.