

**APPROVED PATHWAY:**

1. Includes minimum of three secondary-level credits.
2. Includes a work-based element.
3. Consists of a sequence:
  - Introductory-level.
  - Technical-level.
  - Application-level courses.
4. Supporting documentation includes Articulation Agreement(s), Certification, Program Improvement Plan and a Program of Study.
5. Technical-level and Application-level courses receive .5 state-weighted funding in an approved CTE pathway.



TRANSPORTATION CAREER CLUSTER DESIGN

# Mobile Equipment Maintenance Pathway

CIP CODE 47.9999

## Automotive Collision Strand

### INTRODUCTORY LEVEL

Must choose **ONE** of the boxed courses.

Title	Code	Credit
*Introduction to Industrial Technology	38001	.5 credit
*Introduction to Transportation	40100	.5 credit

Title	Code	Credit
Automotive Information	40050	.5 credit
Business Essentials	12050	.5 credit

### TECHNICAL LEVEL

Title	Code	Credit
***Entrepreneurship	12053	.5 credit
Auto Collision I	40300	1 credit

Title	Code	Credit
Auto Refinishing Comprehensive	40308	1 credit

### APPLICATION LEVEL

Must choose **ONE** of the boxed courses.

Title	Code	Credit
**Auto Collision II	40302	1 credit
**Custom Refinishing A	40314	.5 credit
**Custom Refinishing B	40315	.5 credit

Title	Code	Credit
Research and Emerging Trends in Transportation	40250	.5 credit
Research and Emerging Trends in Transportation	40251	1 credit

- \* One of these two courses is required for pathway approval.
- \*\* Has a prerequisite course.
- \*\*\* Will not count as one of the 3 required secondary level credits for pathway approval. Will count as a funded course.

# KANSAS STATE CAREER CLUSTER COMPETENCY PROFILE

Facility & Mobile Equipment Maintenance Pathway (C.I.P. 47.999)

STUDENT \_\_\_\_\_

Rating Scale:

- 3 - Proficient Achievement
- 2 - Limited Achievement
- 1 - Inadequate Achievement
- 0 - No Exposure

# TRANSPORTATION CLUSTER

Graduation Date \_\_\_\_\_  
I certify that the student has received training in the areas indicated.

Instructor Signature \_\_\_\_\_

Instructor Signature \_\_\_\_\_

Instructor Signature \_\_\_\_\_

Instructor Signature \_\_\_\_\_

## COMMON CAREER TECHNICAL CORE – CAREER READY STANDARDS (To be taught throughout the pathway)

1. Act as a responsible and contributing citizen and employee
2. Apply appropriate academic and technical skills
3. Attend to personal health and financial well-being
4. Communicate clearly, effectively and with reason
5. Consider the environmental, social and economic impacts of decisions
6. Demonstrate creativity and innovation
7. Employ valid and reliable research strategies
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management
10. Plan education and career path aligned to personal goals
11. Use technology to enhance productivity
12. Work productively in teams while using cultural/global competence

## COMMON CAREER TECHNICAL CORE – TRANSPORTATION CLUSTER STANDARDS (To be taught throughout the pathway)

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.
2. Describe the application and use of new and emerging advanced techniques to provide solutions for transportation, distribution and logistics problems.
3. Describe the key operational activities required of successful transportation, distribution and logistics facilities.
4. Identify governmental policies and procedures for transportation, distribution and logistics facilities.
5. Describe transportation, distribution and logistics employee rights and responsibilities and employers' obligations concerning occupational safety and health.
6. Describe career opportunities and means to achieve those opportunities in each of the Transportation, Distribution & Logistics

- Career Pathways.
13. Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
  14. Design ways to improve facility and equipment system performance.

## INTRODUCTORY LEVEL COURSES

### 38001 INTRODUCTION TO INDUSTRIAL TECHNOLOGY (.5 Credit)

- 3 2 1 0
1. Basic Safety
    - Identify causes of accidents and the impact of accident costs.
    - Follow safe behavior procedures on and around ladders, scaffolds and stairs.
    - Follow safe behavior procedures around electrical hazards.
    - Demonstrate the use, care and inspection of appropriate personal protective equipment (PPE)
    - Explain the importance of hazard communications (HazCom) and material safety data sheets (MSDSs).

- Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements.
  - Follow safety procedures required for lifting heavy objects.
  - Demonstrate a working knowledge of safety education, environment, and enforcement for life and work.
  - Apply safe practices while using tools and equipment.
  - Apply safe practices for housekeeping, dress, fire, chemicals & personal protection while working in a shop.
  - Describe fire prevention and firefighting techniques.
  - Explain the purpose of OSHA and how it promotes safety on the job.
- 4 3 2 1 0 2. Industrial Math
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percentages.
  - Use a standard ruler, a metric ruler, and a measuring tape to measure.
  - Demonstrate conversion skills for decimals and fractions.
  - Recognize and perform calculations using metric units of length, weight, volume and temperature.
  - Demonstrate the ability to utilize precision measuring equipment.
- 4 3 2 1 0 3. Hand Tools
- Recognize and identify some of the basic hand tools and their proper uses in industrial trades.
  - Demonstrate the safe use of common hand tools.
- 4 3 2 1 0 3. Power Tools
- Recognize and identify some of the basic power tools and their proper uses

- in the industrial trades.
- Demonstrate the safe use of common power tools.
  - Perform preventive maintenance on basic power tools used in the industrial trades.
- 4 3 2 1 0 5. Blueprint Reading
- Perform the drafting principles needed to draw the basic geometric shapes.
  - Develop a pictorial sketch of an object.
  - Develop a multi-view drawing.
  - Identify basic symbols used in blueprints.
  - Identify various types of blueprint views used in Architecture, Construction, Manufacturing and Engineering.
- 4 3 2 1 0 6. Communication Skills
- Interpret information and follow instructions presented in both verbal and written form.
  - Communicate effectively in on-the-job situations using verbal and written skills in various delivery modes (face-to-face, paper, & electronic).
  - Create and complete various written documents used in industrial trades.
  - Demonstrate knowledge and use of computer systems and word processing software in effective communication.
- 4 3 2 1 0 7. Employability Skills
- Create and utilize employment documents including a cover letter, a resume and portfolio.
  - Demonstrate job seeking and interview skills.
  - Understand and respond to performance reviews.
- 4 3 2 1 0 8. 21st Century/Foundation Skills
- Demonstrate critical thinking skills and

- the ability to solve problems using those skills.
- Define effective relationship skills.
  - Demonstrate a working knowledge of workplace issues such as sexual harassment, stress, and substance abuse.
  - Demonstrate the ability to achieve common goals through team work.
- 4 3 2 1 0 9. Materials Handling
- Verify that health, safety, environmental and government regulations are met.
  - Recognize hazards and follow safety procedures required for materials.
  - Demonstrate ability to load and unload materials properly and safely

## **40100 INTRODUCTION TO TRANSPORTATION (.5 credit)**

- 4 3 2 1 0 1. Explain basic principles of automotive systems and repair.
- 4 3 2 1 0 2. Explain basic principles of collision repair and techniques
- 4 3 2 1 0 3. Explain basic principles of refinishing and custom paint applications
- 4 3 2 1 0 4. Explain basic principles of small engine and powersport repair
- 4 3 2 1 0 5. Explain basic principles of repairing vehicle interiors.
- 4 3 2 1 0 6. Display basic knowledge of custom vehicle parts, applications, and modifications
- 4 3 2 1 0 7. Display basic knowledge of alternative fuels and transportation sources
- 4 3 2 1 0 8. Explain basic principles of Diesel and heavy equipment maintenance &/or repair
- 4 3 2 1 0 9. Research and discuss career and

educational opportunities in  
Transportation.

### **12050 BUSINESS ESSENTIALS (.5 credit)**

(May be offered as a supplemental course in this pathway. Will count toward 3 minimum high school credits required for pathway approval if taught at the high school level. It will not count as the ONLY introductory course for this pathway.)

- 4 3 2 1 0 1. Analyze fundamental economic concepts necessary for employment in business.
- 4 3 2 1 0 2. Describe the nature of business and its contribution to society.
- 4 3 2 1 0 3. Recognize how economic systems influence environments in which businesses function.
- 4 3 2 1 0 4. Analyze cost/profit relationships to guide business decision-making.
- 4 3 2 1 0 5. Describe the purpose and origin of business within the United States.
- 4 3 2 1 0 5. Analyze the history and importance of trade within a global marketplace.
- 4 3 2 1 0 6. Apply verbal skills when obtaining and conveying information.
- 4 3 2 1 0 7. Compose internal and external multi-paragraph documents clearly, succinctly, and accurately to convey and obtain information effectively.
- 4 3 2 1 0 8. Prepare oral presentations to provide information for specific purposes and audiences.
- 4 3 2 1 0 9. Describe the nature of legally binding business contracts.
- 4 3 2 1 0 10. Identify regulatory agencies and regulatory legislation.
- 4 3 2 1 0 11. Identify types of business ownership.
- 4 3 2 1 0 12. Perform customer service activities to support customer relationships and encourage repeat business.

- 4 3 2 1 0 13. Utilize technology to facilitate customer relationship management.
- 4 3 2 1 0 14. Demonstrate managerial and business ethics.
- 4 3 2 1 0 15. Develop personal traits and behaviors to foster career advancement.
- 4 3 2 1 0 16. Analyze entrepreneur careers to determine careers of interest.
- 4 3 2 1 0 17. Compare individual's abilities, interests, and attitudes with those associated with entrepreneurial success to determine the match between the two.
- 4 3 2 1 0 18. Analyze how proper management of personal finance relates with maintaining business financial efficiency.
- 4 3 2 1 0 19. Define the accounting equation and how accounting can assist in maintaining financial solvency.
- 4 3 2 1 0 20. Use information technology tools to manage and perform work responsibilities.
- 4 3 2 1 0 21. Prepare simple documents and other business communications.
- 4 3 2 1 0 22. Understand marketing's role and function in business to facilitate economic exchanges with customers.
- 4 3 2 1 0 23. Explain marketing and its importance in global economy.
- 4 3 2 1 0 24. Describe marketing functions and related activities.
- 4 3 2 1 0 25. Develop personal traits and behaviors to foster career advancement.
- 4 3 2 1 0 26. Identify the impact business has on local communities.
- 4 3 2 1 0 27. List the standards and qualifications that must be met in order for entering a business career.

- 4 3 2 1 0 28. Utilize critical thinking and decision-making skills to exhibit qualifications to a potential employer.

### **40050 - AUTOMOTIVE INFORMATION**

#### **(.5 Credit)**

(May be offered as a supplemental course in this pathway. This course will count toward 3 minimum high school credits required for pathway approval if taught at the high school level. It will not count as the ONLY Introductory course for this pathway.) Provides students with the opportunity to learn practical car maintenance skills. Students will attain basic skills and knowledge needed to own and maintain a vehicle. The students will learn what to consider when buying a car, shopping for car insurance, acquiring a title, etc.

- 4 3 2 1 0 1. Automotive Safety and tools–Work with and around vehicles safely including tool id and safe usage.
- 4 3 2 1 0 2. Electrical Systems –Check and clean battery terminals, jump start a vehicle, change fuses, headlights, and taillights.
- 4 3 2 1 0 3. Powertrain and chassis –Identify parts and components, identify noises, inspect for idle quality, and slippage; including brake id, inspection, and noise.
- 4 3 2 1 0 4. Tires & Steering Alignment- Inspect tire for tire wear, find correct tire inflation information, change a tire, visually check for alignment problems, check tire air pressure, and recognize balance problems.
- 4 3 2 1 0 5. Fluids - Check, identify, and fill fluids, including, engine, transmission, brake, power steering, washer, and coolant.
- 4 3 2 1 0 6. How to buy a car – Conduct research

on vehicle insurance, titles, taxes, mechanical condition and appearance as it applies to buying a vehicle.

- 4 3 2 1 0 7. Recommended maintenance – Demonstrate knowledge of fluids, timing belt, filters, etc. service intervals - including where this information can be found.
- 4 3 2 1 0 8. Vehicle upkeep including interior and exterior –Maintain the interior and exterior of their vehicle to keep it in the best condition.

## TECHNICAL LEVEL COURSES

### 40150 - GENERAL SERVICE I (1 Credit)

- 4 3 2 1 0 1. Shop Operations and Safety
  - Identify sources of service information
  - Identify and demonstrate safe shop procedures
  - Operate tools and equipment safely
  - Explain and use chemical safety procedures
  - Demonstrate proper use of PPE (personal protective equipment)
- 4 3 2 1 0 2. Engine Repair
  - Demonstrate knowledge of engine fundamentals
  - Demonstrate knowledge of fluid maintenance
  - Inspect engine assembly for fluid leaks and recommend repair needs
- 4 3 2 1 0 3. Drive Train
  - Perform inspection of fluid levels on transmissions and axles
  - Lubricate u-joints
  - Inspect CV joints and boots
  - Explain basic transmission operation

- 4 3 2 1 0 4. Suspension and Steering
  - Inspect steering fluid levels
  - Demonstrate knowledge of steering systems
  - Inspect system for leaks
  - Inspect tires for wear and proper pressures
  - Demonstrate knowledge of TPM systems
- 4 3 2 1 0 5. Brakes
  - Demonstrate knowledge of brake principles
  - Inspect brake fluid levels
  - Demonstrate knowledge of brake fluids
  - Inspect hoses, fittings and lines for damage
  - Inspect brake pads and shoes for wear and thickness
  - Inspect rotors, drums and related hardware
- 4 3 2 1 0 6. Electrical Systems
  - Demonstrate knowledge of electrical principles
  - Solder/repair electrical wiring and connections
  - Identify components of electrical schematics
  - Understand basic diagnostic and troubleshooting processes
  - Perform battery maintenance and testing
  - Inspect vehicle lighting and basic electrical systems
- 4 3 2 1 0 7. HVAC
  - Demonstrate knowledge of HVAC fundamentals
  - Identify refrigerants used in Mobile HVAC
  - Identify and visually inspect HVAC components

- 4 3 2 1 0 8. Engine Performance
  - Perform engine scan tests
  - Interpret scan data and trouble codes
  - Identify and explain fuel delivery systems
  - Identify and explain exhaust and emission systems
  - Identify and explain ignition systems
  - Inspect vehicle filters

### 40210 - ALTERNATIVE POWER (.5 Credit)

A technical level course designed to provide students with basic theories and information needed to develop an understanding of alternative power vehicles.

- 4 3 2 1 0 1. Shop Operations and Safety
  - Identify and retrieve sources of service information
  - Identify and demonstrate safe shop procedures, including safe operation of tools
  - Demonstrate knowledge of chemical safety, including proper handling and disposal of hazardous materials
  - Demonstrate proper use of PPE (Personal Protective Equipment)
- 4 3 2 1 0 2. Hybrid Technology
  - Recognize various hybrid technologies
  - Discuss principles of power transmission
  - Discuss principles of regenerative braking
  - Compare impact on vehicle emissions from hybrid technologies
- 4 3 2 1 0 3. Flexible Fuel Vehicles
  - Describe/Explain FFV principles of flexible fuel production
- 4 3 2 1 0 4. Electric Vehicles

- Explain principles of energy production and power storage
- Describe/Explain electrical motor principles
- Describe/Explain solar technology principles

- 4 3 2 1 0 5. Hydrogen and Fuel Cell Vehicles  
Describe/Explain principles of hydrogen storage  
Describe/Explain fuel cell technology  
Describe/Explain usage of hydrogen in internal combustion
- 4 3 2 1 0 6. Emerging Trends  
-Research and report on future and emerging trends in alternative and green power

**(40218) DIESEL ENGINE TECHNOLOGY (.5 Credit)**

- 4 3 2 1 0 1. Correctly identify and describe the parts of a diesel internal combustion engine
- 4 3 2 1 0 2. Demonstrate knowledge of air induction systems
- 4 3 2 1 0 3. Demonstrate knowledge of diesel fuel systems
- 4 3 2 1 0 4. Identify and describe operation of diesel exhaust system
- 4 3 2 1 0 5. Locate and describe the operation of diesel engine emission devices
- 4 3 2 1 0 6. Understand and describe diesel engine design and emerging trends
- 4 3 2 1 0 7. Research applicable diesel engine service information such as fluid types, service bulletins, and service precautions

**40212 - SMALL GAS ENGINES AND POWERTRAINS I (1 Credit)** A comprehensive, technical level course to instruct students in the knowledge and skills common to all small engine operation and repair.

- 4 3 2 1 0 1. Demonstrate and apply safe working practices with tools and machines.
- 4 3 2 1 0 2. Identify and follow safety procedures as outlined in OSHA guidelines.
- 4 3 2 1 0 3. Identify, service needs and maintain the working parts of 2 and 4 stroke cycle engines.
- 4 3 2 1 0 4. Explain and demonstrate a working knowledge of engine systems on 2 and 4 stroke cycle engines.
- 4 3 2 1 0 5. Prepare a repair order and estimate required time and materials to accomplish service procedure
- 4 3 2 1 0 6. Utilize precision measuring equipment
- 4 3 2 1 0 7. Use and interpret service literature
- 4 3 2 1 0 8. Demonstrate an understanding of primary drive mechanisms
- 4 3 2 1 0 9. Demonstrate the ability to perform a leak inspection.
- 4 3 2 1 0 10. Demonstrate the ability to disassemble and reassemble an engine.
- 4 3 2 1 0 11. Remove and install an engine.
- 4 3 2 1 0 12. Compare and contrast various types of transmissions and drive systems.
- 4 3 2 1 0 13. Explain the principles of electricity as they pertain to small engines and powertrains.
- 4 3 2 1 0 14. Discuss/Explain the principles of hydraulics.
- 4 3 2 1 0 15. Interpret and follow reference manuals, schematics, diagrams, flow charts, symbols and technical procedures.
- 4 3 2 1 0 16. Perform troubleshooting techniques

**12053 – ENTREPRENEURSHIP (.5 credit)**  
**(Does NOT count as one of the 3 required secondary level credits for pathway approval)**

- 4 3 2 1 0 1. Solve mathematical problems using numbers and operations
- 4 3 2 1 0 2. Incorporate algebraic skills to make business decisions
- 4 3 2 1 0 3. Demonstrate an understanding of how basic economic concepts are utilized by an entrepreneur/small business owner
- 4 3 2 1 0 4. Explain and describe cost/benefit analysis as it explains cost-profit relationships
- 4 3 2 1 0 5. Explain and demonstrate the nature of effective communications
- 4 3 2 1 0 6. Describe methods in dealing with conflict as it relates with entrepreneurship/small business ownership
- 4 3 2 1 0 7. Describe the relationship between principled entrepreneurship versus personal responsibility
- 4 3 2 1 0 8. Describe the relationship between government and business
- 4 3 2 1 0 9. Identify types of business ownership
- 4 3 2 1 0 10. Demonstrate understanding of managerial and business ethics
- 4 3 2 1 0 11. Analyze and define entrepreneurship
- 4 3 2 1 0 12. Expound on the importance of entrepreneurship on market economies
- 4 3 2 1 0 13. Explain characteristics of an entrepreneur as it relates to personal assessment and management
- 4 3 2 1 0 14. Identify successful methods in developing and assessing innovative business ideas
- 4 3 2 1 0 15. Give explanation on how

- entrepreneurs recognize marketplace opportunities
- 4 3 2 1 0 16. Explain tools used by entrepreneurs for venture planning
- 4 3 2 1 0 17. Explain proper methods in assessing and calculating risk in developing a business venture
- 4 3 2 1 0 18. Describe the need for continuation planning as it relates with entrepreneurship/small business ownership
- 4 3 2 1 0 19. The student demonstrates an understanding of information management concepts and how they support effective business operations
- 4 3 2 1 0 20. Describe the impact of the Internet on entrepreneurship/small business ownership
- 4 3 2 1 0 21. Understand marketing's role and function in business to facilitate economic exchanges with customers
- 4 3 2 1 0 22. Analyze the role of marketing research in constructing a small business management model
- 4 3 2 1 0 23. Describe marketing functions and related activities
- 4 3 2 1 0 24. Describe the components and purpose of a business plan
- 4 3 2 1 0 25. Examine and explain the components and purpose of a financial plan for a business
- 4 3 2 1 0 26. Identify and evaluate a local entrepreneurial venture/business
- 4 3 2 1 0 27. Develop organizational skills to improve efficiency
- 4 3 2 1 0 28. Identify and explain expense control strategies to enhance the financial wellbeing of a business
- 4 3 2 1 0 29. Give explanation on how entrepreneurs incorporate accounting in making business decisions

- 4 3 2 1 0 30. Understand the need for proper financial and money management as it relates to an entrepreneur/small business owner
- 4 3 2 1 0 31. Develop personal traits and behaviors to foster career advancement

### **40300 - AUTO COLLISION I (1 Credit)**

A comprehensive course designed to instruct students in the knowledge and skills common to the collision industry.

- 4 3 2 1 0 1. Orientation
- Demonstrate first aid and safety
  - Demonstrate proper handling and use of dangerous and hazardous materials
  - Demonstrate proper use, care, and cleaning of tools and equipment
  - demonstrate knowledge of collision and repair industry
  - Identify auto body and components
  - Identify frame and unibody components
- 4 3 2 1 0 2. Cosmetic Panel Repair
- Analyze sheet metal damage
  - Straighten sheet metal panel
  - Demonstrate proper shrinking techniques
  - Demonstrate proper repair procedures for high strength steels
- 4 3 2 1 0 3. Welding and Cutting Steel
- Set up and use Oxyacetylene equipment
  - Set up and use GMAW equipment
  - Set up and use Plasma Arc Torch
- 4 3 2 1 0 4. Remove and Install Parts and Assemblies
- Remove and install trim components

- Remove, install and adjust bolt panels and assemblies
  - Remove and install glass
  - Remove and install welded bonded panels
- 4 3 2 1 0 5. Plastic Repair
- Identify plastic types
  - Use proper repair techniques for plastics
- 4 3 2 1 0 6. Sealant and Corrosion Protection
- Display proper selection and application of seam sealers
  - Identify and perform necessary steps to restore corrosion protections
  - Identify and demonstrate proper use of sound deadening materials and foams
- 4 3 2 1 0 7. Refinishing
- Identify and describe refinishing materials and equipment
  - Prepare surface for refinishing including using proper masking techniques
  - Apply primers, sealers & topcoats
  - Block and finish sand surface
  - Demonstrate sand buff and polish procedures
- 4 3 2 1 0 8. Detailing
- Prepare vehicle for delivery (clean, vacuum and apply dressing)
  - Perform final vehicle inspection

### **40308 - AUTO REFINISHING COMPREHENSIVE (1 Credit)**

A comprehensive course designed to instruct students in the knowledge and skills common to the Auto Refinishing industry.

- 4 3 2 1 0 1. Orientation
- Demonstrate basic understanding of

- the refinishing trade and use of terminology
- Identify and perform good safety practices in the shop including safe & proper use and cleaning of tools and equipment
  - Understand maintenance and limitations of ventilation and filtration as it pertains to shop environment and personal safety
  - Demonstrate proper handling and disposal procedures of hazardous materials
- 4 3 2 1 0 2. Refinishing
- Identify and describe refinishing materials and equipment
  - Identify & describe surface preparation for refinishing (Wax & grease removers; Sanding)
  - Identify & demonstrate knowledge of masking (types of masking tape and paper)
  - Identify basic types of primers and their uses
- 4 3 2 1 0 3. Spray Guns
- Identify types of spray guns and their purpose
  - Identify parts and cleaning of spray guns
- 4 3 2 1 0 4. Finish Applications
- Demonstrate knowledge of paint reduction
  - Demonstrate gun spraying techniques
  - Demonstrate application of primers and topcoats
  - Demonstrate use of Block & Finish primers
  - Perform color sanding
- 4 3 2 1 0 5. Paint Defects – Causes and Cures
- Identify paint or primer defects
  - Identify cause(s) of paint defects
- Apply problem solving skills to resolve defects
- 4 3 2 1 0 6. Detail
- Demonstrate Compound & Polish procedures
  - Clean and inspect work
  - Clean interior and exterior surfaces and body openings
  - Apply decals and striping if applicable
- 4 3 2 1 0 7. Orientation
- Demonstrate basic understanding of the refinishing trade
  - Identify and perform good safety practices in the shop
  - Explain maintenance and limitations of ventilation and filtration as it pertains to shop environment and personal safety
  - Demonstrate proper handling and disposal procedures of hazardous materials
  - Demonstrate proficiency in safely using tools and equipment related to the refinishing trade, to include preventive maintenance procedures
- 4 3 2 1 0 8. Refinishing
- Prepare surface for refinishing (wax & grease removers; metal conditioners; sanding)
  - Demonstrate masking skills (types of masking tapes & paper and their uses; apron; spray mask; pre-mask; reverse masking)
- 4 3 2 1 0 9. Primer
- Explain primers and their use in the industry
  - Compare and contrast Primer classifications (physical drying; chemical drying)
  - Evaluate types of primers (metal conditioners; self-etching primer;
- primer surface & sealer; sealers; polyester primer surface
- 4 3 2 1 0 10. Spray Gun Operation
- Describe the mechanical operation and atomization
  - Describe parts and functions.
  - Distinguish types of spray guns and their uses (siphon feed and gravity feed)
  - Demonstrate spray patterns
  - Recognize and analyze spray problem
  - Demonstrate proficiency in spray gun cleaning and preventive maintenance
- 4 3 2 1 0 11. Paint Components Knowledge
- Discuss pigment
  - Discuss binders/resins, solvents/volatiles
  - Discuss use of additives
  - Discuss solids content
- 4 3 2 1 0 12. Paint and Primer Application
- Demonstrate proficiency in paint reduction
  - Demonstrate proficiency in measuring paint reduction (percentages; mixing cup types; mixing sticks)
  - Discuss use of air pressure in paint application processes
  - Safely use compressors and air filtration in finish applications
- 4 3 2 1 0 13. Basic Color Principles
- Discuss the theory of light as it pertains to paint
  - Differentiate primary, secondary, intermediate, tertiary, and colors
  - Explain color mixing
- 4 3 2 1 0 14. General Spraying Techniques
- Demonstrate knowledge of gun distance, angle and speed
  - Demonstrate knowledge of triggering.
  - Demonstrate overlap procedures
  - Identify gun control problems and

- causes, and select appropriate solutions
- 4 3 2 1 0 15. Application
- Apply primers, topcoats and blends
  - Apply block and finish primers
  - Apply multi-state coating
  - Demonstrate proper procedures for color sanding
- 4 3 2 1 0 16. Detail
- Demonstrate proficiency in compound and polish procedures
  - Clean, inspect and analyze work
  - Clean interior & exterior surfaces and body openings
  - Apply decals and striping
- 4 3 2 1 0 17. Paint Defects – Causes and Cures
- Analyze causes of paint or primer defects
  - Apply problem solving skills to resolve defects

#### **40200 – FUNDAMENTALS OF ELECTRONIC / ELECTRICAL SYSTEMS (1 Credit)**

A comprehensive, technical level course designed to provide students with the basic theories, equipment, and skills needed to inspect and service electrical systems.

- 4 3 2 1 0 1. Apply knowledge & understanding of basic electrical theories to construct & analyze all types of basic electrical circuits
- 4 3 2 1 0 2. Utilize electrical system schematics to locate & identify components, analyze & repair electrical circuits
- 4 3 2 1 0 3. Compute unknown voltages, amperage & resistances in basic circuit types, using Ohms Law
- 4 3 2 1 0 4. Check continuity in electrical circuits

- using a test light, DVOM
- 4 3 2 1 0 5. Check for shorts, opens, & grounds.
- 4 3 2 1 0 6. Measure resistance in electrical circuits using an ohmmeter
- 4 3 2 1 0 7. Measure voltage with a voltage meter
- 4 3 2 1 0 8. Measure current with an ammeter and amp probe
- 4 3 2 1 0 9. Diagnose and repair wires, terminals and wiring harnesses.
- 4 3 2 1 0 10. Clean & inspect battery clamps, cables, and connectors.
- 4 3 2 1 0 11. Perform battery condition tests.
- 4 3 2 1 0 12. Jump-start a vehicle.
- 4 3 2 1 0 13. Charge & install a battery.
- 4 3 2 1 0 14. Diagnose starting system problems & determine necessary action.
- 4 3 2 1 0 15. Remove, clean, and inspect starter motor & components & reinstall.
- 4 3 2 1 0 16. Use voltage drop test to determine electrical circuit condition.
- 4 3 2 1 0 17. Apply knowledge & understanding of a parasitic drain test.
- 4 3 2 1 0 18. Diagnose charging systems & repair or replace components if necessary.
- 4 3 2 1 0 19. Remove, clean, inspect and reinstall generator (alternator).
- 4 3 2 1 0 20. Maintain and restore electronic memory functions and identify and perform required reinitialization or code entry after a battery voltage loss

#### **40220 - ENGINE PERFORMANCE I (.5 Credit)**

A comprehensive, technical level course designed to provide students with the basic skills needed to inspect, understand and diagnose engine control systems.

- 4 3 2 1 0 1. Conduct engine performance tests

- using diagnostic test equipment & determine necessary action.
- 4 3 2 1 0 2. Identify engine service precautions for hybrid vehicles
- 4 3 2 1 0 3. Retrieve and record diagnostic trouble codes
- 4 3 2 1 0 4. Access VIN information, electronic service information and complete customer repair order
- 4 3 2 1 0 5. Utilize a scan tool to view computer data stream information
- 4 3 2 1 0 6. Identify and test computer input sensors & devices
- 4 3 2 1 0 7. Identify and test computer controlled output devices
- 4 3 2 1 0 8. Identify, test and replace ignition system primary and secondary components
- 4 3 2 1 0 9. Diagnose ignition related no start conditions
- 4 3 2 1 0 10. Diagnose ignition related misfire conditions, power loss, and poor drivability

#### **40224 - STEERING/SUSPENSION (.5 Credit)**

A comprehensive, technical level course designed to provide students with the basic theories, equipment, and skills needed to inspect and service steering and suspension systems.

- 4 3 2 1 0 1. Perform a prealignment inspection
- 4 3 2 1 0 2. Clean and inspect power & manual steering gear boxes.
- 4 3 2 1 0 3. Inspect, repair and replace steering linkage components.
- 4 3 2 1 0 4. Diagnose conventional & electronic front suspension systems; determining necessary action.
- 4 3 2 1 0 5. Inspect control arm and spring assemblies on conventional systems.
- 4 3 2 1 0 6. Inspect wheel spindles and bearings.

- 4 3 2 1 0 7. Inspect shock absorbers and stabilizer bars.
- 4 3 2 1 0 8. Diagnose McPherson strut assemblies and determine necessary action.
- 4 3 2 1 0 9. Diagnose steering and tire wear problems, determining necessary action.
- 4 3 2 1 0 10. Rotate and balance tires, install and torque wheel assemblies, and adjust tire pressure.
- 4 3 2 1 0 11. Inspect, diagnose and calibrate tire pressure monitoring system

#### **40204 - BRAKES (.5 Credit)**

A comprehensive, technical level course designed to provide students with the basic theories, equipment, and skills needed to inspect and service braking systems.

- 4 3 2 1 0 1. General Brake Systems Diagnosis
  - Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause and correction.
- 4 3 2 1 0 2. Hydraulic System Diagnosis and Repair
  - Diagnose pressure concerns in the brake system using hydraulic principles, Pascal's Law.
  - Diagnose poor stopping, pulling, or dragging concerns, caused by malfunctions in the hydraulic system; determine necessary action.
  - Inspect brake system for leaks, rust, cracks, and bulging or wear in lines.
  - Fill brake fluids to proper level.
  - Fabricate and/or install brake lines.
  - Describe the purpose of the metering (hold-off) proportioning (balance), pressure differential and combination

- valves.
- Inspect, test, and/or replace components of brake warning light system.
- Describe the different types of brake fluids and select the correct type for the vehicle to be worked on
- Identify and describe the master cylinder operation
- Describe different methods of bleeding brakes, and demonstrate at least one method

- 4 3 2 1 0 3. Drum Brake Diagnosis and Repair
  - Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine necessary action.
  - Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
  - Inspect, measure brake drums, and reassemble.
  - Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.

- 4 3 2 1 0 4. Disc Brake Diagnosis and Repair
  - Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.
  - Clean and inspect caliper mounting and slides for wear and damage; determine necessary action.
  - Remove, clean, and inspect pads and retaining hardware; determine necessary action.
  - Clean, inspect and measure rotor with

- a dial indicator and a micrometer; follow manufacture's recommendations in determining need to machine or replace.
- Describe or demonstrate caliper piston retraction on an integrated parking brake system
- 4 3 2 1 0 5. Power Assist Units Diagnosis and Repair
  - Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.
  - Demonstrate an understanding of and the application of a hydraulically assisted power brake system
- 4 3 2 1 0 6. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair
  - Diagnose wheel bearing noises, wheel shimmy, and vibration concern
  - Replace wheel bearing and grease
  - Remove and reinstall sealed wheel bearing assembly
  - Inspect and replace wheel studs
  - Demonstrate an understanding of and the application of air brake systems
- 4 3 2 1 0 7. Antilock Brake and Traction Control System
  - Identify and inspect antilock brake system (ABS components)
  - Describe ABS principles of operation and retrieve ABS codes
  - Demonstrate proper removal and reinstallation of the tire and wheel assembly including proper torque of lug nuts.

## 40228 - MOBILE HVAC (.5 Credit)

A comprehensive course designed to provide students with the basic and advanced theory of operation, service and repair of the air conditioning, heating, and vehicle cooling system as it relates to the mobile climate control system.

- 4 3 2 1 0 1. A/C System Diagnosis and Repair
- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause & correction, and identify and interpret heating and air conditioning concern
  - Performance test A/C system including abnormal noises, and leak test.
  - Identify refrigerant type; select and connect proper gauge set and record temperature and pressure readings.
  - Using scan tool, observe and record HVAC data and trouble codes and determine the proper repair procedure.
- 4 3 2 1 0 2. Refrigeration System Component Diagnosis and Repair
- Remove, inspect, and reinstall A/C compressor and mountings; determine oil quantity
  - Inspect and replace A/C compressor drive belts, pulleys, and tensioners.
  - Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action
  - Inspect A/C condenser for airflow restrictions; remove, inspect, and replace receiver/drier or accumulator/drier; determine oil

quantity

- Remove, inspect, and replace evaporator and condenser

### 4 3 2 1 0 3. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

- Diagnose temperature control problems in the heater/ventilation system
- Inspect engine cooling and heater system hoses and belts, inspect, test, and replace thermostat and gasket/seal,
- Determine coolant condition and coolant type for vehicle application; drain and recover coolant, Flush system; refill system with recommended coolant; bleed system.
- Inspect and test electric/mechanical cooling fan, fan control system and circuits.
- Inspect and test heater control valve(s); Remove, inspect, and replace heater core.

### 4 3 2 1 0 4. Operating Systems and Related Controls Diagnosis and Repair

- Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems including A/C, heater blower, motors, resistors, switches, relays, wiring, and protection devices
- Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the HVAC system including clutch control system and head unit

### 4 3 2 1 0 5. Refrigerant Recovery, Recycling, and Handling

- Identify and recover A/C system

- refrigerant including recycling, labeling, and storing of refrigerant
- Evacuate and charge A/C system and add refrigerant oil as needed

## 40208 - DRIVE TRAIN TECHNOLOGY (.5 Credit)

A comprehensive, technical level course designed to provide students with the basic theories and skills needed to inspect and service drive train components.

- 4 3 2 1 0 1. Inspect and adjust shift linkage & transmission range sensor/switch
- 4 3 2 1 0 2. Inspect, test and locate electrical/electronic transmission components including, solenoids, sensors, relays, connectors, switches & harnesses.
- 4 3 2 1 0 3. Use a scan tool to read transmission related data and diagnostic trouble codes.
- 4 3 2 1 0 4. Identify basic manual transmission components and calculate gear ratios.
- 4 3 2 1 0 5. Inspect and diagnose constant-velocity & standard universal joints for noise & vibration concerns
- 4 3 2 1 0 6. Inspect rear axle differential fluid and diagnose rear axle noise and vibration concerns
- 4 3 2 1 0 7. Research applicable vehicle and service information, such as transmission/transaxle operation, fluid type and service needs, bulletins and service precautions
- 4 3 2 1 0 8. Identify and interpret transmission/transaxle concerns and determine necessary operation
- 4 3 2 1 0 9. Inspect and determine cause of fluid leaks, condition, level, and replace fluid and filter where applicable
- 4 3 2 1 0 10. Perform stall test and determine

- necessary action
- 4 3 2 1 0 11. Perform transmission pressure test using Pascal's law to diagnose pressure concerns.
- 4 3 2 1 0 12. Inspect clutch pedal linkage, and cables, and adjust as necessary.
- 4 3 2 1 0 13. Inspect hydraulic slave and master cylinders, lines and hoses for leaks and condition and bleed system.
- 4 3 2 1 0 14. Diagnose abnormal clutch operation and noise.

#### **40216 - ENGINE MECHANICAL REPAIR- Gas &/or Diesel (.5 Credit)**

This course covers the tools, skills, and techniques required to perform base engine mechanical repair and testing. This includes engine removal, installation, and maintenance.

- 4 3 2 1 0 1. Correctly identify the parts and describe the operation of an internal combustion engine (diesel, gas, 2-stroke, 4-stroke).
- 4 3 2 1 0 2. Inspect engine assembly for fuel, oil, coolant and other leaks, and determine necessary action
- 4 3 2 1 0 3. Disassemble and reassemble an internal combustion engine correctly, including finding engine torque and assembly specifications. This may be done in modules. (Example: Cylinder Head Gasket, valve train, and crankshaft)
- 4 3 2 1 0 4. Identify, safely use and maintain tools needed to perform mechanical repairs including precision measurement tools.
- 4 3 2 1 0 5. Identify the machining processes involved with engine mechanical repair.
- 4 3 2 1 0 6. Clean and inspect engine

parts to determine their quality and usability; including magna-fluxing and die testing.

- 4 3 2 1 0 7. Demonstrate knowledge of the removal and installation of engine including inspecting for leaks.
- 4 3 2 1 0 8. Inspect, repair, or service cooling & lubrication system components.
- 4 3 2 1 0 9. Demonstrate broken fastener and thread repair techniques
- 4 3 2 1 0 10. Demonstrate knowledge of the various type for gaskets, sealers, and thread lockers and their usages

#### **APPLICATION LEVEL COURSES**

##### **40152 - GENERAL SERVICE II (1 Credit)**

(Must offer General Service I prior to this course) A Comprehensive, application level course designed to provide students with knowledge in the theory of operation, the equipment and the skills necessary for employment in the field of automotive and light truck service.

- 4 3 2 1 0 1. Shop Operations and Safety
- Identify & retrieve sources of service information
  - Demonstrate safe shop procedures
  - Operate tools and equipment safely and perform routine preventative maintenance
  - Demonstrate proper handling of chemicals used in the automotive shop
  - Utilize PPE (personal protective equipment) properly in all required shop areas
  - Demonstrate proper handling and

- disposal of hazardous materials
- 4 3 2 1 0 2. Engine Repair
- Demonstrate engine removal procedures
  - Inspect cooling system components
  - Disassemble, clean and inspect engine components
  - Perform engine diagnostic tests
  - Perform engine maintenance procedures
- 4 3 2 1 0 3. Drive Train
- Perform fluid service on transmissions and axles
  - Demonstrate drive shaft removal and installation
  - Service u-joints
  - Inspect and service CV joint equipped drivelines
  - Research and differentiate between four-wheel drive and AWD operation
  - Research and discuss clutch operation and service
- 4 3 2 1 0 4. Suspension and Steering
- Demonstrate knowledge of steering and suspensions
  - Inspect and replace steering fluid
  - Inspect system for leaks and determine necessary action
  - Demonstrate knowledge of component replacement
  - Perform a pre-alignment inspection
  - Demonstrate knowledge of principles of steering geometry
  - Rotate tires according to manufacturer's recommendation
  - Dismount, inspect and repair wheels and tires
  - Balance wheel/tire assembly
  - Demonstrate working knowledge of proper wheel torque
  - Demonstrate proper service of TPM

- systems
- 4 3 2 1 0 5. Brakes
  - Demonstrate knowledge of brake principles
  - Inspect and service brake fluid
  - Demonstrate brake system bleeding procedures
  - Repair and/or replace hoses, fittings and lines
  - Replace brake pads, shoes and associated assemblies
  - Service rotors and drums according to manufacturer's specs
  - Inspect caliper and wheel cylinder assemblies
  - Service wheel bearing assemblies
  - Perform operational brake inspection
- 4 3 2 1 0 6. Electrical Systems
  - Demonstrate knowledge of electrical principles
  - Solder/repair electrical wiring and connections
  - Utilize schematics in electrical diagnoses
  - Research and explain basic diagnostic and troubleshooting processes
  - Perform starting and charging system tests
  - Demonstrate the proper usage of a test light and DVOM
  - Demonstrate battery service
  - Test, diagnose and repair electrical systems
- 4 3 2 1 0 7. HVAC
  - Discuss/ Compare & Contrast HVAC systems
  - Demonstrate proper refrigerant recovery procedures -Conduct performance tests of HVAC system and determine necessary action
- 4 3 2 1 0 8. Engine Performance

- Perform engine scan tests -Interpret scan data and trouble codes
- Perform emissions testing
- Perform engine diagnostic procedures
- Discuss/Compare & Contrast fuel systems
- Diagnose problems with intake and exhaust systems
- 4 3 2 1 0 9. Alternative Energy
  - Research and compare & contrast basic alternative power systems

**40154 - GENERAL SERVICE III (1 Credit)**

(Must offer General Service II prior to this course)  
 An advanced application level course that provides students opportunities to perform inspection, diagnosis and repair of automobiles and light-duty trucks. May include on-the-job training and internship opportunities.

- 4 3 2 1 0 1. Shop Operations and Safety
  - Utilize service information in automotive repair procedures
  - Evaluate shop environment for proper safety procedures
  - Demonstrate fastener usage and repair
  - Discuss operations and safety of SRS systems
  - Utilize safety precautions in servicing of high voltage power systems
  - Locate and utilize technical service bulletins
- 4 3 2 1 0 2. Engine Repair
  - Remove and replace cooling system components
  - Perform engine diagnostic tests
  - Utilize precision measuring instruments in testing & diagnostic procedures
  - Determine necessary action for engine

- components after disassembly and cleaning
- Change engine oil and filter
- Change fuel filter
- 4 3 2 1 0 3. Drive Train
  - Remove and replace CV shafts
  - Remove and replace u-joints
  - Inspect 4wd/AWD Transfer case and determine appropriate function
- 4 3 2 1 0 4. Suspension and Steering
  - Perform a pre-alignment inspection
  - Properly set-up alignment equipment and demonstrate understanding of proper operation
  - Demonstrate knowledge and proper adjustment procedures for 2 wheel and 4-wheel alignment techniques
- 4 3 2 1 0 5. Brakes
  - Demonstrate knowledge of ABS brake principles
  - Replace brake pads and shoes and associated assemblies
  - Service rotors and drums according to manufacturer's specs
  - Inspect, diagnose and repair caliper and wheel cylinder assemblies
  - Inspect and service parking brake
  - Discuss/Compare and Contrast operational principles of traction control and accident avoidance systems
  - Analyze brake stop light function and determine necessary action
  - Replace wheel bearing assemblies
- 4 3 2 1 0 6. Electrical Systems
  - Replace and aim headlights and bulbs
  - Diagnose repair needs for starters, relays and solenoids
  - Maintain or restore electronic memory functions

#### 4 3 2 1 0 7. HVAC

- Demonstrate proper refrigerant recovery procedures
- Conduct performance tests of HVAC system and determine necessary action.
- Perform leak test
- Remove and replace HVAC components
- Inspect and recharge HVAC system with refrigerant
- Perform AC system evacuation.
- Inspect, diagnose and repair air conditioner compressor and clutch
- Inspect, diagnose and repair electrical HVAC control circuits
- Inspect, diagnose, replace and repair compressor seals
- Diagnose heating system malfunctions
- Service heater control system

#### 4 3 2 1 0 8. Engine Performance

- Explain the basic operating principles of ignition systems
- Diagnose ignition system for proper operation
- Identify basic principles of electronic engine management.
- Identify basic diagnostic steps for engine control systems
- Perform engine scan test
- Interpret scan data and trouble codes
- Perform operational tests of engine sensors, and control units
- Demonstrate knowledge of emissions system
- Perform emission system diagnostic procedures and identify components

- Perform engine mechanical diagnostic procedures
- Perform diagnostic tests of fuel delivery system and identify components.
- Diagnose engine temperature related concerns and identify components
- Remove and replace thermostat and gasket
- Diagnose air intake and exhaust systems and identify components

### **40302 - AUTO COLLISION II (1 Credit)**

A comprehensive, application level course designed to provide students with the skills needed to perform diagnosis and repair in the Collision Industry.

#### 4 3 2 1 0 1. Orientation

- Access and utilize environmental protection regulations and practices

#### 4 3 2 1 0 2. Collision Report Writing

- Analyze damage and select appropriate repair procedures
- Interpret and apply collision estimation information
- Prepare damage report in logical sequence
- Compile parts order
- Complete work order and authorization

#### 4 3 2 1 0 3. Advanced Cosmetic Panel Repair

- Straighten complex sheet metal damage
- Demonstrate proficient use of body fillers

#### 4 3 2 1 0 4. Welding & Cutting Steels

- Set up and use Oxyacetylene equipment
- Use GMAW equipment to perform

welds

- Straighten and align frame or unibody damage

- Replace unitized components

#### 4 3 2 1 0 5. Research and understand new, advanced materials used in vehicle construction

#### 4 3 2 1 0 6. Electrical Operations

- Read and apply wiring diagrams
- Replace or repair damaged wiring
- Replace and aim headlight assemblies
- Demonstrate safety knowledge of supplemental restraint systems

#### 4 3 2 1 0 7. Collision Related Mechanical Operations

- Remove and replace components as needed based on diagnostics
- Demonstrate basic understanding of wheel alignment terminology

### **40314 - CUSTOM REFINISHING A (.5 Credit)**

An advanced application level course designed to provide students with the skills needed to perform diagnosis and repair in custom refinishing.

#### 4 3 2 1 0 1. Orientation

- Discuss differences between the refinishing industry and the custom refinishing /application industry
- Utilize good safety practices in the shop
- Research and discuss maintenance and limitations of ventilation and filtration as it pertains to shop environment and personal safety
- Demonstrate proper handling and disposal procedures for hazardous materials

-Demonstrate knowledge, safety and preventive maintenance procedures of tools and power equipment

4 3 2 1 0 2. Refinishing

- Identify and discuss usage of custom refinishing / application materials
- Inspect and adjust spray equipment / adjust application equipment
- Prepare surface for paint including proper masking procedures
- Apply primer, sealer and/or basecoat where needed
- Apply clear coat / intercoat if required for custom procedure

**40315 - CUSTOM REFINISHING B (.5 Credit)**

(Custom Refinishing & Applications A is a prerequisite for this course.)

An advanced application level course offering students further opportunities for creative applications in custom refinishing.

4 3 2 1 0 3. Custom Application

- Identify and discuss custom technique to be used and formulate a plan of action
- Prepare and organize materials
- Prepare surface for paint or application
- Formulate paint
- Apply custom technique or application to the surface
- Apply clear coat

4 3 2 1 0 4. Paint Defects – Causes and Cures

- Identify paint or application defects and their cause(s)
- Apply problem solving skills to resolve defects

4 3 2 1 0 5. Final Detail

- Color sand and buff paint surface

-Clean and inspect work

**40222 - ENGINE PERFORMANCE II (1 Credit)**

A comprehensive, application level course designed to provide students with the skills needed to inspect, service and repair engine control systems.

- 4 3 2 1 0 1. Retrieve and interpret computer diagnostic codes and data to repair computer related engine problems.
- 4 3 2 1 0 2. Identify, remove & replace faulty computer input sensors and output devices
- 4 3 2 1 0 3. Locate and interpret computer diagnostic monitor data
- 4 3 2 1 0 4. Use a scan tool to record & interpret computer data information
- 4 3 2 1 0 5. Explain the process used to download and install on-board computer updates
- 4 3 2 1 0 6. Diagnose fuel and air induction system problems & determine necessary action
- 4 3 2 1 0 7. Inspect, repair, and/or replace fuel supply components
- 4 3 2 1 0 8. Disassemble, clean, inspect and replace fuel injection components
- 4 3 2 1 0 9. Diagnose & repair exhaust system Concerns including exhaust color and odor
- 4 3 2 1 0 10. Diagnose emission control systems problems & determine necessary action
- 4 3 2 1 0 11. Clean, inspect and replace Positive Crankcase Ventilation (PCV) system components
- 4 3 2 1 0 12. Clean, inspect and replace exhaust gas recirculation (EGR) components
- 4 3 2 1 0 13. Test, inspect and replace exhaust treatment components

4 3 2 1 0 14. Test, inspect and replace fuel vapor control system components

4 3 2 1 0 15. Demonstrate knowledge of the 5 exhaust gasses and determine the possible causes of faulty readings

4 3 2 1 0 16. Conduct engine mechanical noise and performance tests using diagnostic test equipment & determine necessary action. (Example: compression, leakage, vacuum, and back pressure)

4 3 2 1 0 17. Verify cam shaft timing

**40214 - ADVANCED SMALL ENGINES AND POWERTRAINS (1 Credit)**

An application level course providing students with advanced knowledge and skills common to all small engine operations and repair.

- 4 3 2 1 0 1. Perform preventive maintenance on tools and equipment
- 4 3 2 1 0 2. Follow safety procedures as outlined in OSHA guidelines
- 4 3 2 1 0 3. Perform electrical system service, diagnostics and testing
- 4 3 2 1 0 4. Perform fuel system service and diagnosis
- 4 3 2 1 0 5. Perform ignition system service and diagnosis
- 4 3 2 1 0 6. Describe and explain the principles of multiple cylinder engines
- 4 3 2 1 0 7. Perform starting and charging system service and diagnosis
- 4 3 2 1 0 8. Demonstrate advanced troubleshooting techniques
- 4 3 2 1 0 9. Research and discuss advantages and disadvantages of Alternative Power Systems

## 40206 - ADVANCED BRAKES (.5 Credit)

A comprehensive, application level course designed to provide students with the advanced skills needed to inspect, service and repair braking systems to industry standards.

### 4 3 2 1 0 1. General Brake Systems Diagnosis

- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause and correction
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns, determine necessary action.

### 4 3 2 1 0 2. Hydraulic System Diagnosis and Repair

- Measure brake pedal height; determine necessary action
- Check master cylinder for leaks and proper operation; determine necessary action
- Remove, bench bleed, and reinstall master cylinder
- Flush or bleed hydraulic system.

### 4 3 2 1 0 3. Drum Brake diagnosis and Repair

- Remove, inspect, and install wheel cylinders
- Remove, inspect, refinish, and measure drum

### 4 3 2 1 0 4. Disc Brake Diagnosis and Repair

- Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.
- Disassemble and clean caliper assembly inspect part for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.
- Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks

- Remove, refinish and replace rotor either on or off vehicle

- Adjust caliper equipped with an integrated parking brake system

### 4 3 2 1 0 5. Power Assist Units Diagnosis and Repair

- Test pedal free travel with and without engine running; check power assist operation.
- Inspect the vacuum-type power booster unit for vacuum leaks and inspect the check valve for proper operation; Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. - Measure and adjust master cylinder pushrod length
- Inspect and test hydraulic/electric assisted power brake system for leaks and proper operation; determine necessary action.

### 4 3 2 1 0 6. Diagnosis and Repair of Wheel Bearings, Parking Brakes, Electrical, Etc.

- Inspect and diagnose parking brake operation including parking brake cables and components, for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed
- Analyze operation of brake stop light system and the parking brake indicator light system
- Demonstrate proper removal and reinstallation of tire wheel assembly including proper torque of lugnuts

### 4 3 2 1 0 7. Antilock Brake and Traction Control System

- Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the

antilock brake system (ABS); determine necessary action. Diagnose antilock brake system (ABS) electronic controls and components using self-diagnosis and/or recommended test equipment; including braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc)

- Depressurize high-pressure components of the antilock brake system (ABS)
- Bleed the antilock brake system's (ABS) front and rear hydraulic circuits
- Remove and install antilock brake system (ABS) electrical and hydraulic components
- Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO) or digital volt ohm meter (DVOM) (including output signal, resistance, shorts to voltage/ground, and frequency data)
- Identify traction control/vehicle stability control system components

### 4 3 2 1 0 8. Identify and describe traction control / vehicle stability control system and its components

## 40226 - ADVANCED STEERING & SUSPENSION (.5 Credit)

A comprehensive, application level course designed to provide students with the advanced skills needed to inspect, service and repair steering and suspension systems.

### 4 3 2 1 0 1. Steering System Service & Repair

- Diagnose steering systems and

- determine necessary action
- Clean, inspect, adjust and install power & manual steering gear boxes and rack and pinion steering gears.
- Inspect and repair steering column and steering linkage components
- Inspect, repair and replace power steering pumps and hydraulic lines.
- Disable and enable SRS systems following manufacturer's procedures
- Test & diagnose electronically controlled steering systems: determine necessary action
- 4 3 2 1 0 2. Diagnose & Repair Front and Rear Suspension Systems
  - Diagnose conventional & electronic front suspension systems; determine necessary action
  - Inspect and repair control arm and spring assemblies on conventional systems
  - Inspect and repair wheel spindles and bearings
  - Inspect and replace shock absorbers and stabilizer bars
  - Diagnose, inspect and assemble - McPherson strut assemblies and determine necessary action
  - Test & diagnose components of electronically controlled suspension systems; determine necessary action
- 4 3 2 1 0 3. Tire & Wheel Alignment Service
  - Diagnose steering and tire wear problems; determine necessary action
  - Set correct alignment angles on front and rear wheels
  - Dismount, inspect, repair and remount tire on wheel
- 4 3 2 1 0 4. Diagnose vibration, measure tire and wheel run-out

### **40202 - ADVANCED ELECTRONICS/ ELECTRICAL SYSTEMS (1 Credit)**

- A comprehensive, application level course designed to provide students with the advanced skills needed to inspect, service and repair electrical circuits and devices.
- 4 3 2 1 0 1. Identify location of Hybrid vehicle high voltage circuit disconnect location & safety procedures
  - 4 3 2 1 0 2. Diagnose lighting system problems; inspect, replace and aim headlights and bulbs
  - 4 3 2 1 0 3. Repair or replace sockets, wires and switches
  - 4 3 2 1 0 4. Diagnose and repair gauge, warning and horn circuits
  - 4 3 2 1 0 5. Diagnose and repair wiper, windshield washer, and motor-driven accessory circuits
  - 4 3 2 1 0 6. Diagnose & repair heated glass & electric locks
  - 4 3 2 1 0 7. Diagnose & repair cruise control Systems
  - 4 3 2 1 0 8. Diagnose & repair supplemental restraint systems
  - 4 3 2 1 0 9. Diagnose & repair radio systems
  - 4 3 2 1 0 10. Diagnose & repair keyless entry and anti-theft systems
  - 4 3 2 1 0 11. Diagnose body electrical systems with a scan tool
  - 4 3 2 1 0 12. Use test equipment to record and diagnose waveforms from electrical sensors and actuators
  - 4 3 2 1 0 13. Use a scan tool to check computer communication systems.

### **40250 - RESEARCH AND EMERGING TRENDS IN TRANSPORTATION (.5 Credit)**

An advanced research and application course covering specific topics in transportation. Should

- include opportunities for IHT, OJT and/ or Internships.
- 4 3 2 1 0 1. Research and report on careers in transportation
- 4 3 2 1 0 2. Research and report on "Green" applications in the Transportation industry
- 4 3 2 1 0 3. Research and discuss Modern & Future trends in equipment, methods, & techniques
- 4 3 2 1 0 4. Utilize effective management techniques to organize work flow
- 4 3 2 1 0 5. Work with customer or client to complete a client-driven project
- 4 3 2 1 0 6. Access and utilize industry resources
- 4 3 2 1 0 7. Use appropriate grammar and word usage in the creation and delivery of a formal graphic presentation using current standards and technology
- 4 3 2 1 0 8. Use technology and resources to research licensing certification and credentialing in the transportation industry
- 4 3 2 1 0 9. Conduct project and facility evaluations and critique their effectiveness

### **40251 - RESEARCH AND EMERGING TRENDS IN TRANSPORTATION (1 Credit)**

- An advanced research and application course covering specific topics in transportation. Should include opportunities for IHT and/ or Internships. (May be delivered as two .5 credit courses)
- 4 3 2 1 0 1. Research and report on careers in transportation
  - 4 3 2 1 0 2. Research and report on "Green" applications in the Transportation industry
  - 4 3 2 1 0 3. Research and discuss Modern & Future

trends in equipment, methods &  
techniques

- 4 3 2 1 0 4. Utilize effective management techniques to organize work flow
- 4 3 2 1 0 5. Work with multiple customers or clients to complete client-driven projects
- 4 3 2 1 0 6. Access and utilize industry resources
- 4 3 2 1 0 7. Use appropriate grammar and word usage in the creation and delivery of a formal graphic presentation using current standards and technology
- 4 3 2 1 0 8. Use technology and resources to research licensing certification and credentialing in the transportation industry
- 4 3 2 1 0 9. Conduct project and facility evaluations and critique their effectiveness
- 4 3 2 1 0 10. Demonstrate an understanding of OSHA regulations for personal safety, including utilization of PPE, safe use of tools & equipment, and safe handling of hazardous materials
- 4 3 2 1 0 11. Create a portfolio to document activities completed while working with a mentor or through an internship in the transportation industry