**Course Description:**

In this first course, students will apply skills needed to inspect and perform general service on vehicles. Students will research applicable service information and technical service bulletins and perform maintenance on vehicles. Students will inspect and service engine, drive train, suspension, steering, electrical and braking systems. Students will perform ignition maintenance including spark plug/glow plug and ignition wire and coil pack replacement. Additionally, students change fluids, filters and inspect vehicles for leaks and fluid condition.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face‐to‐face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.

1.1.2. Identify the scope of career opportunities and the requirements for education, training,

certification, licensure and experience.

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and

postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations and

organized labor and use networking techniques to develop and maintain professional

relationships.

1.1.5. Develop strategies for self‐promotion in the hiring process (e.g., filling out job applications,

résumé writing, interviewing skills, portfolio development).

1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate

associated behaviors in fulfilling personal, community and workplace roles.

1.1.7. Apply problem‐solving and critical‐thinking skills to work‐related issues when making decisions

and formulating solutions.

1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to

establish and maintain professionalism.

1.1.9. Give and receive constructive feedback to improve work habits.

1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.

1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect

for them.

1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive

behavior.

**Outcome 1.2. Leadership and Communications**

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.

1.2.4. Use negotiation and conflict‐resolution skills to reach solutions.

1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an

intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem‐solving and consensus‐building techniques to draw conclusions and determine

next steps.

1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence

internal and external workplace relationships.

1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications

(e.g., common content for large audience, control of tone, speed, cost, lack of non‐verbal

cues, potential for forwarding information, longevity).

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a

team.

1.2.11. Write professional correspondence, documents, job applications and resumés.

1.2.12. Use technical writing skills to complete forms and create reports.

1.2.13. Identify stakeholders and solicit their opinions.

1.2.14. Use motivational strategies to accomplish goals.

**Outcome 1.3. Business Ethics and Law**

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

**Competencies**

1.3.1. Analyze how regulatory compliance affects business operations and organizational

performance.

1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work

environment.

1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal

integrity, compassion, justice).

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety

data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental

Protection Agency [EPA], United States Occupational Safety and Health Administration

[OSHA]) that contribute to the continuous improvement of the organization.

1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door‐to‐door sales,

deceptive service estimates, fraudulent misrepresentations) and their overall impact on

organizational performance.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act [ADA], Fair Labor Standards Acts [FLSA], Equal Employment Opportunity Commission [EEOC]).

1.3.8. Verify compliance with computer and intellectual property laws and regulations.

1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal,

organizational and professional ethical standards.

**Outcome 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner,

public address systems).

1.4.2. Select and use software applications to locate, record, analyze and present information (e.g.,

word processing, e‐mail, spreadsheet, databases, presentation, Internet search engines).

1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access,

accuracy issues, client and patient record confidentiality) pertaining to technology specific to

the industry pathway.

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure and monitor business records.

1.4.6. Use an electronic database to access and create business and technical information.

1.4.7. Use personal information management and productivity applications to optimize assigned

tasks (e.g., lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

**Outcome 1.5. Global Environment**

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

**Competencies**

1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are

interdependent.

1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an

organization.

1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.

1.5.4. Recognize barriers in cross‐cultural relationships and implement behavioral adjustments.

1.5.5. Recognize the ways in which bias and discrimination may influence productivity and

profitability.

1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.

1.5.7. Use intercultural communication skills to exchange ideas and create meaning.

1.5.8. Identify how multicultural teaming and globalization can foster development of new and

improved products and services and recognition of new opportunities.

**Outcome 1.6. Business Literacy**

Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

**Competencies**

1.6.1. Identify business opportunities.

1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g., risk versus reward, reasons for success and failure).

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

1.6.8. Identify the features and benefits that make an organization’s product or service competitive.

1.6.9. Explain how the performance of an employee, a department and an organization is assessed.

1.6.12. Describe classifications of employee benefits, rights, deductions and compensations.

**Outcome 1.7. Entrepreneurship/Entrepreneurs**

Analyze the environment in which a business operates and the economic factors and opportunities associated with self-employment.

**Competencies**

1.7.10. Describe techniques for obtaining experience (e.g., apprenticeship, co-operative [co-op] education, work placement, internship, job shadowing) related to an entrepreneurial objective.

**Outcome 1.8. Operations Management**

Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

**Competencies**

1.8.4. Identify alternative actions to take when goals are not met (e.g., changing goals, changing strategies, efficiencies).

1.8.5. Use inventory and control systems to purchase materials, supplies and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).

1.8.6. Identify the advantages and disadvantages of carrying cost and Just-in-Time [JIT] productions systems and the effects of maintaining inventory (e.g., perishable, shrinkage, insurance) on profitability.

1.8.8. Identify routine activities for maintaining business facilities and equipment.

1.8.10. Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

**Outcome 1.10. Sales and Marketing**

Manage pricing, place, promotion, packaging, positioning and public relations to improve quality customer service.

**Competencies**

1.10.2. Determine the customer’s needs and identify solutions.

1.10.3. Communicate features, benefits and warranties of a product or service to the customer.

1.10.4. Identify the company policies and procedures for initiating product and service improvements.

1.10.5. Monitor customer expectations and determine product/services satisfaction by using measurement tools.

1.10.10. Demonstrate sales techniques.

**Strand 2. Safety, Tools and Maintenance**

Learners apply principles of safety and use of tools to maintain equipment and the environment to prevent accidents and mitigate hazards.

**Outcome 2.1. Facility Safety**

Handle materials, prevent accidents and mitigate hazards.

**Competencies**

2.1.1. Use Occupational Safety and Health Administration (OSHA)-defined procedures for identifying employer and employee responsibilities, situations that require working in confined spaces and safety labeling.

2.1.2. Identify and communicate hazards associated with slippery surfaces and lighting.

2.1.5. Identify the reason to use ground fault interrupter circuits (GFCIs), sources of electrical hazards and established shutdown and lock-out/tag-out procedures.

2.1.6. Identify and eliminate workplace clutter and maintain clearance and boundaries.

2.1.7. Identify symptoms of exposure to health-threatening environments (e.g., temperature; chemical; biological; noise, vibrations, harshness [NVH] hazards).

2.1.8. Identify procedures for handling, storage and disposal of hazardous materials.

2.1.9. Identify locations and describe use of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.

2.1.10. Describe the interactions of incompatible substances in measuring and mixing chemicals.

2.1.11. Select and operate fire extinguishers based on the class of fire.

2.1.12. Conduct safety inspection of a workspace.

2.1.13. Identify the types of ergonomic workflow and the need for them.

2.1.14. Inspect air and exhaust systems, intake filters, fans and other mechanical components.

**Outcome 2.2. Personal Safety**

Practice personal safety.

**Competencies**

2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.

2.2.2. Describe the risk factors associated with working under the influence of drugs, alcohol and stimulants and how it increases the risk of accident, lowers productivity, raises insurance costs and reduces profits.

2.2.3. Select, use, maintain and dispose of Personal Protective Equipment (PPE) appropriate to job tasks, conditions and materials.

2.2.4. Identify workplace risk factors associated with repetitive motion and lifting, operating and moving heavy objects.

2.2.5. Demonstrate appropriate body mechanics in lifting and moving heavy objects.

**Outcome 2.3. Tool and Equipment Preventative Maintenance**

Identify, use, clean, maintain and perform planned preventative maintenance on tools and equipment.

**Competencies**

2.3.1. Identify the types of hand tools, power tools and stationary equipment and describe their function.

2.3.2. Identify potential hazards and limitations related to the use of hand tools, power tools and stationary equipment.

2.3.3. Operate power tools and stationary equipment in accordance with established procedures and safety standards.

2.3.4. Ensure the presence and functionality of safety systems and hardware.

2.3.5. Clean, lubricate and adjust power tools and stationary equipment.

2.3.6. Identify, select and maintain fluids and filters.

2.3.7. Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles).

2.3.8. Identify the requirements for calibrating metering, monitoring and sensing equipment.

**Outcome 2.4. General Maintenance**

Provide general maintenance to mechanical systems.

**Competencies**

2.4.1. Inspect for leakage at seals, gaskets and bushings.

2.4.2. Inspect fluid levels and fluid conditions on all mechanical systems.

2.4.3. Select engine, powertrain, power steering and brake system fluids based on characteristics and applications.

2.4.4. Describe characteristics of engine fuels and fuel additives.

2.4.5. Perform engine oil and filter change.

2.4.6. Replace fuel filters.

2.4.7. Flush and fill the engine cooling system.

2.4.8. Inspect, service, or replace air filters, filter housings and intake ductwork.

2.4.9. Drain and replace drivetrain fluids and filters.

2.4.10. Flush, fill and bleed the power steering system and replace filters.

2.4.11. Flush, fill and bleed the brake system.

2.4.12. Store mechanical systems fluids and waste products.

2.4.13. Inspect and replace drive belts.

2.4.14. Identify the sources of air conditioner (A/C) odors.

2.4.15. Inspect and service the battery and battery cables, connectors, clamps and hold downs.

2.4.16. Inspect interior and exterior lamps and sockets.

2.4.17. Verify operation of instrument panel gauges and warning/indicator lights and reset maintenance indicators.

2.4.18. Test windshield wiper and washer operations, replace wiper blades and refill the washer reservoir (where applicable).

2.4.19. Inspect, repair to industry standards and rotate tires and reset the tire pressure monitor system (TPMS).

2.4.20. Lubricate all suspension and chassis grease fittings and body lubrication points.

2.4.22. Inspect, repair or replace fasteners.

**Strand 3. Engine Adjustments and Repair**

Learners apply principles of computerized engine controls, two- and four-stroke cycle combustion, emission controls, cooling systems, cylinder head and block assemblies and lubrication systems to diagnose and repair malfunctions in recreational vehicles, automobiles and medium and heavy equipment.

**Outcome 3.1. Engine Cylinder Head and Block Assemblies**

Remove, disassemble and repair components in engine cylinder head and block assemblies.

**Competencies**

3.1.5. Inspect an engine assembly for fuel, oil, coolant and other leaks and determine potential causes.

**Outcome 3.2. Computerized Engine Controls**

Perform diagnosis and repair of computerized engine controls.

**Competencies**

3.2.1 Retrieve and record stored on-board diagnostics (OBD) trouble codes and clear codes where applicable.

**Outcome 3.4. Fuel, Air Induction and Exhaust System**

Perform fuel, air induction and exhaust system inspection and repair.

**Competencies**

3.4.6. Inspect the air induction system, intake manifold and gaskets for vacuum leaks or unmetered air.

3.4.10. Inspect the exhaust manifold, exhaust pipes, mufflers, catalytic converters, resonators, tail pipes and heat shields.

**Outcome 3.5. Lubrication and Cooling Systems**

Inspect lubrication and cooling systems operation.

**Competencies**

3.5.3. Perform oil sampling and consumption tests.

3.5.5. Inspect and test the radiator, pressure cap, coolant recovery tank and hose, cooling and heater system hoses and water pump.

3.5.6. Remove and replace radiator, pressure cap, coolant recovery tank and hose, cooling and heater system hoses.

3.5.7. Inspect, test and replace the thermostat and gasket.

3.5.8. Measure coolant concentration using a refractometer.

3.5.9. Identify types of coolants and their applications.

3.5.10. Test, drain, flush and refill coolant and bleed the cooling system.

3.5.12. Inspect mechanical and electrical fans, fan clutches, fan shrouds and air dams.

**Strand 4. Systems Performance**

Learners apply principles of brake systems, electrical and electronic systems and heating, ventilation and air conditioning (HVAC) systems to diagnose and repair malfunctions.

**Outcome 4.1. Hydraulic Brake Systems**

Identify, inspect and replace hydraulic components of brake systems.

**Competencies**

4.1.6. Inspect brake lines for damage and wear.

**Outcome 4.2. Drum and Disc**

Identify, inspect and replace mechanical components of drum and disc brake systems.

**Competencies**

4.2.2. Inspect caliper assembly, inspect and measure disc brake pads.

4.2.4. Remove, clean, inspect and measure drums and rotors.

4.2.7. Clean, inspect and lubricate brake shoes, retaining hardware and adjustment hardware.

4.2.8. Remove and replace brake shoes, retaining hardware and adjustment hardware.

4.2.9. Pre-adjust brake shoes, seat the pads and adjust the parking brake system.

4.2.10. Lubricate drum and disc brake assembly components, reinstall and inspect for leaks.

4.2.11. Check the condition and operation of the parking brake, indicator light and brake stop light systems.

**Outcome 4.3. Air Brake Systems**

Identify, inspect and replace air brake systems.

**Competencies**

4.3.10. Inspect air system lines, hoses, fittings and couplings.

**Outcome 4.5. Electrical and Electronic Systems**

Diagnose the electrical and electronic integrity of series, parallel and series-parallel circuits using principles of electricity (e.g., Ohm’s Law, Watt’s Law).

**Competencies**

4.5.1. Describe basic electrical theory.

4.5.3. Describe static (open circuit) and dynamic (closed circuit) testing principles.

4.5.4. Measure the source voltage and perform voltage drop and current draw tests in electrical and electronic circuits.

**Outcome 4.6. Batteries**

Diagnose and service batteries.

**Competencies**

4.6.2. Test battery performance using state-of-charge and conductance tests and record results.

4.6.4. Maintain or restore electronic memory functions.

4.6.5. Perform a battery charge.

4.6.6. Star a vehicle using jumper cables and a battery or auxiliary power supply using manufacturer’s jumping techniques and precautions.

4.6.7. Perform battery maintenance and repairs.

4.6.8. Remove and replace a battery.

**Outcome 4.7. Starting and Charging Systems**

Identify, inspect and replace staring and charging system components.

**Competencies**

4.7.3. Perform charging system output tests to identify causes of undercharge, no charge and overcharge conditions.

4.7.4. Inspect and adjust or replace alternator drive belts, pulleys and tensioners and check pulley and belt alignment.

4.7.6. Identify the high voltage circuit of electric or hybrid electric vehicles and related safety precautions.

**Outcome 4.8. Lighting and Accessories**

Identify, inspect and replace electrical and electronic components of lighting systems and accessories.

**Competencies**

4.8.1. Identify the cause of brighter than normal, intermittent, dim, or no light operation.

4.8.2. Inspect, replace and aim headlights and bulbs.

4.8.3. Identify and inspect incorrect turn signal or hazard light operation.

4.8.5. Identify system voltage and safety precautions associated with high-intensity discharge headlights.

4.8.7. Identify incorrect horn operation.

4.8.8. Identify incorrect wiper and washer operation and replace.

4.8.9. Identify incorrect operation of motor-driven accessories.

4.8.11. Identify incorrect electric lock operation and repair.

**Outcome 4.9. Heating, Ventilation and Air Conditioning Systems**

Diagnose and repair heating, ventilation and air conditioning (HVAC) system components and controls.

**Competencies**

4.9.1. Describe the components and operation of the HVAC system.

**Strand 5. Drivetrain**

Learners apply principles of transmissions and transaxles, manual drivetrains and axles, steering and suspension, drive shafts and wheels to diagnose and repair malfunctions in recreational vehicles, automobiles and medium and heavy equipment to manufacturer’s specifications.

**Outcome 5.1. Automatic Transmission and Transaxle Performance**

Identify, inspect, adjust and replace automatic transmissions and transaxles.

**Competencies**

5.1.1. Research applicable vehicle and service information (e.g., transmission and transaxle system operation, fluid type, vehicle service history, service precautions, technical service bulletins).

5.1.2. Locate and interpret vehicle and major component identification numbers (i.e., vehicle identification number [VIN], vehicle certification labels, calibration decals).

5.1.3. Investigate fluid loss and condition concerns.

5.1.6. Inspect for leaks on cooler lines and fittings.

**Outcome 5.3. Clutches**

Identify and inspect clutches.

**Competencies**

5. 3.2. Inspect the clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots and springs.

5.3.3. Inspect the hydraulic clutch slave and master cylinders, lines and hoses.

5.3.7. Inspect and adjust the clutch master cylinder levels and check for leaks.

**Outcome 5.5. Steering**

Identify, inspect and replace steering system components.

**Competencies**

5.5.3. Inspect steering shaft universal joints and flexible couplings.

**Outcome 5.8. Wheels and Tires**

Identify, inspect and replace wheel and tire components and assemblies.

**Competencies**

5.8.1. Identify tire wear patterns and tire construction.

5.8.2. Identify bearing noises and wheel vibration, shimmy and noise.

5.8.3. Inspect and repair or replace front and rear wheel bearings.

5.8.4. Measure wheel, tire, axle and hub runout.

5.8.5. Balance wheel and tire assembly.

5.8.6. Remove, inspect, repair or replace, rotate and reinstall the tire and wheel assembly and calibrate the tire pressure monitoring system.

5.8.7. Inspect and replace wheel studs.