

Introduction to Vehicle Systems & Maintenance

Course Number - 20106

Rationale Statement:

There is a high demand for vehicle maintenance, service and repair, sales and support staff. With the increasing complexity of the modern transportation there is also a high demand for understanding of basic operating principle of today's systems of operation. Introduction to vehicle systems and maintenance gives students the opportunity to explore these principles.

Suggested Grade Level: 9-12

Topics Covered:

- Safety related to transportation systems and maintenance
- Proper application and maintenance of tools and equipment
- Principles of chemical, mechanical, and physical functions of modern vehicle systems
- Document maintenance procedures
- Appropriate business practices
- Vehicle service and repairs
- Principles and operations of electrical systems
- Principles of automotive brakes, steering, suspension and automatic and manual transmission systems
- Career opportunities in TDL

Core Technical Standards & Examples

Indicator #1: Understand the value and necessity of practicing personal occupational safety and protecting the environment by using material and processes in accordance with manufacturing and industry standards	
Bloom's Taxonomy Level	Standard and Examples
Apply	ITVSM1.1. Demonstrate basic understanding of career related safety concerns. Examples: <ul style="list-style-type: none">• Completion of safety training and exam• Review OSHA Standards, if applicable• Successful completion of safety review packet• Successful completion of research on current shop safety practices

Analyzing	<p>ITVSM1.2. Demonstrate knowledge and understanding of common environmental conservation practices and their applications.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Research and apply EPA standards regarding automotive maintenance chemicals such as waste oil, refrigerant, and coolant • Compose a written report on proper handling and disposal of hazardous materials involved in automotive maintenance
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Apply	<p>ITVSM1.3. Practice the safe handling and storage of chemical and hazardous waste in accordance with material safety data sheets and the requirements of local, state, and federal regulations.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Consult MSDS (material safety data sheets) and compose a report on the proper handling of hazardous chemicals (i.e. carburetor cleaner) • Identify procedures for the storage and disposal of oil soaked rags and other flammable materials
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Evaluate	<p>ITVSM1.4. Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and their effects on the environment.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understanding the formation of carbon monoxide in internal combustion engines and the effects on the environment • Study the effects of vehicle emissions on the eco-system • Compare and contrast the emission of hydro-fuel cell, electric, and gasoline powered vehicles
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Indicator #2 Students will demonstrate an understanding of the safe and appropriate use of tools, equipment and work processes

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>ITVSM2.1. Understand and use the appropriate tools and equipment.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrate proper usage of tools and equipment • Inspect and perform preventative and required maintenance of tools and equipment
Apply	<p>ITVSM2.2. Diagnose, and analyze components and systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use DMM (digital multi-meter) to measure electrical voltage, amps and resistance • Demonstrate use of a load tester on a battery, charging, and starting systems
Evaluate	<p>ITVSM2.3. Select and demonstrate proper use of measuring devices and mathematical formulas.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify the measuring instruments needed to assure proper tolerance ranges can be achieved (i.e. micrometer, caliper) • Identify, apply, and calculate mathematical formulas that apply to the automotive industry (i.e. Ohm's Law, cubic inch displacement, horse power)
Evaluate	<p>ITVSM2.4. Use and understand standard and metric units of measurements.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure brake rotor with caliper and compare to specifications • Measure tread width and mathematically calculate the sidewall height of the tire using the aspect ratio of the tire • Convert standard units and metric units
Apply	<p>ITVSM2.5. Use measurement devices to diagnose and repair vehicles and components following industry standards.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify tools and equipment used to measure caster, camber and toe • Measure resistance in spark plug high-tension leads to assure proper operation of ignition system

Apply	<p>ITVSM2.6. Demonstrate how to access and proper usage of TSBs (technical service bulletins) and service manuals.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Utilize service information to find vehicle specifications • Use vehicle owner’s manual to find proper quantity and quality of oil to use to perform an engine oil and filter change • Use scan tool to pull trouble codes from vehicle’s computer diagnostic system
Apply	<p>ITVSM2.7. Comprehend the importance of calibration processes, systems, techniques using various measuring and testing devices.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Calibrate of a dial indicator • Check the accuracy of an outside/inside micrometer • Calibrate an Ohm meter

Indicator #3 Students understand scientific principles in relation to chemical, mechanical, and physical functions of various power plants and vehicle systems:

Bloom’s Taxonomy Level	Standard and Examples
Analyze	<p>ITVSM3.1. Demonstrate knowledge of the operation of the internal combustion engine.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify different types of gasoline and diesel engines and 2 & 4 stroke engines • Compare and contrast the similarities and differences in a 2 and 4 stroke cycle
Apply	<p>ITVSM3.2. Demonstrate a basic understanding of the operating principles of heating and air conditioning systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify the components of heating and air conditioning systems • Describe the air flow and refrigerant flow in heating and air conditioning systems
Evaluate	<p>ITVSM3.3. Analyze alternate fuel and power sources.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and research hybrid, fuel cell, and electric vehicles for a written report or presentation

Indicator #4 Students perform and document maintenance procedures according to manufacturer's specifications:

Bloom's Taxonomy Level	Standard and Examples
Apply	<p>ITVSM4.1. Demonstrate the procedures and practices for manufacturer's repair and maintenance schedules.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Change oil and filter according to manufacturer's specs • Check proper inflation and condition of vehicle tires • Check and refill critical fluids • Inspect belts and hoses
Apply	<p>ITVSM4.2. Demonstrate the use of service information to repair a vehicle.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Utilization of service information to find vehicle specifications • Usage of vehicle owner manual to find proper quantity and quality of oil to use to perform an engine oil and filter change
Apply	<p>ITVSM4.3. Demonstrate proper procedures for work order, customer information, and billing information completion.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrate the proper use of a repair order that contains critical information • Complete work orders with customer, labor, and parts information

Indicator #5: Understanding and applying appropriate business practices.

Bloom's Taxonomy Level	Standard and Examples
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Apply	<p>ITVSM5.1 Demonstrate the importance of and the procedures for maintaining accurate records.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Recording the mileage of a vehicle on the work order for warranty purposes • Billing of customers and collection of funds • Taxes and required taxable income
Apply	<p>ITVSM5.2 Understand the concept and application of ethical business practices.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Marking up parts for profit • Installation of quality new and/or used parts • Only necessary repairs should be made
Apply	<p>ITVSM5.3 Understand the concept and application of acceptable customer relations practices.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Return all settings of radio, seat and steering wheel positions to customers settings • Respect customers opinions of the vehicles problems
Indicator #6: Understanding and applying appropriate vehicle service and repairs.	
Bloom's Taxonomy Level	Standard and Examples
Evaluate	<p>ITVSM6.1 Perform general engine diagnosis and repair in professional manor within ASE standards.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Perform engine compression test dry/wet • Remove, diagnose condition, set gap, and replace spark plugs and wires as needed
Analyze	<p>ITVSM6.2 Demonstrate ability to maintain and service lubrication and cooling systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Analyze engine oil pressure • Remove and install an oil pressure sending unit • Inspect and test cooling system and pressure cap

Apply	<p>ITVSM6.3 Understand the basic operation of computer controlled systems and location and identification of related parts.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use a code reader and or scanner to diagnose computer system failure • Locate and test computer components • Clear trouble codes from computer with scanner
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Indicator #7: Students understand the function, principles and operation of electrical and electronic systems using manufacturers and industry standards.

Bloom's Taxonomy Level	Standard and Examples
Apply	<p>ITVSM7.1 Demonstrate an understanding how to diagnose and repair electrical systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Clean battery terminals and electrical connections • Use DVOM (digital volt Ohm meter) to check voltage drop at connections • Use DVOM to check resistance in electrical circuits
Apply	<p>ITVSM7.2 Diagnose and service batteries</p> <p>Examples:</p> <ul style="list-style-type: none"> • Check battery state-of-charge with hydrometer or DVOM • Check battery load capacity with load tester • Remove and replace battery
Apply	<p>ITVSM7.3 Demonstrate knowledge needed to, diagnose and repair starting and charging systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Check starting system draw with starting system tester • Check charging system output with charging system tester
Apply	<p>ITVSM7.4 Demonstrate ability to properly diagnose and repair lighting systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Adjust headlights • Replace bulbs • Test electrical system circuits and components

Apply	<p>ITVSM7.5 Demonstrate ability to properly diagnose and repair heating and air conditioning systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Test strength and condition of coolant • Remove and replace coolant and flush if needed • Test output temperature of A/C system
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Indicator #8: Students understand the function and principles of automotive brake, steering and suspension, automatic and manual transmission systems.

Bloom's Taxonomy Level	Standard and Examples
Apply	<p>ITVSM8.1 Demonstrate how to diagnose and service hydraulic and power brake assist systems.</p> <p>Example:</p> <ul style="list-style-type: none"> • Check brake pad dimensions and conditions • Check condition of rotor and/or drum • Check for leaks, cracks or bulges in brake lines • Check emergency brake cable operation
Apply	<p>ITVSM8.2 Demonstrate how to diagnose and service steering and suspension systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Check for proper power steering fluid condition and level • Check condition of front and rear struts and/or shocks
Apply	<p>ITVSM8.3 Demonstrate how to diagnose and service automatic and manual transmissions.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Check automatic and manual transmission fluid levels • Replace automatic transmission fluid and filter

Indicator #9: Students explore career opportunities in the transportation, distribution, and logistics career cluster and develop leadership skills.

Bloom's Taxonomy Level	Standard and Examples
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Apply	ITVSM9.1 Demonstrate independent and teamwork skills and explore career opportunities within the industry Examples: <ul style="list-style-type: none">• Participate in CTSO's (i.e SkillsUSA, Ford AAA Student Auto Skills, etc)• Develop a teamwork project• Utilize guidance software to research and report on career opportunities• Update student portfolios and personal learning plans
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