

Automotive Technology





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The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Automotive Technology Program of Study. The academic standards in this document are theoretical and performance-based. The standards contain content from Colorado, Maryland, Tennessee, and Texas and were validated by D.C. business and industry partners. All content is used with permission.

In addition to academic standards, OSSE has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and Work-Based Learning resources and requirements by course level.

This document is intended for use by educational administrators and practitioners. A similar document is available for each state-approved CTE Program of Study.



Automotive Technology

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Course Descriptions: Automotive Technology		
Course Level	Course Information	Description
Level I	Automotive Basics OSSEID: 5160101 Grades: 9-12 Prerequisite: None Credit: 1	<p>Automotive Basics includes knowledge of the basic automotive systems and the theory and principles of the components that make up each system and how to service these systems.</p> <p>Automotive Basics includes applicable safety and environmental rules and regulations. In Automotive Basics, students will gain knowledge and skills in the repair, maintenance, and servicing of vehicle systems. This study allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.</p>
Level II	Automotive Technology I OSSEID: 5160102 Grades: 10-12 Prerequisite: Automotive Basics Credit: 1	<p>Automotive Technology I: Maintenance and Light Repair includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. This course includes applicable safety and environmental rules and regulations. In Automotive Technology I: Maintenance and Light Repair, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.</p>
Level III	Automotive Technology II Practice OSSEID: 5160103 Grades: 11-12 Prerequisite: Automotive Technology I Credit: 1	<p>Automotive Technology II: Automotive Service includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. Automotive Technology II: Automotive Service includes applicable safety and environmental rules and regulations. In this course, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.</p>
Level IV	Practicum in Automotive Technology OSSEID: 5160104 Grades: 12	<p>Practicum in Automotive Technology is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as</p>



	Prerequisite: Automotive Technology II Credit: 1	internships, mentorships, independent study, or laboratories. The Practicum can be either school lab based or worked based.
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Industry Certifications

Work-Based Learning Examples and Resources

Level I Course	Level II Course	Level III Course	Level IV Course
Career Exploration Industry Visits Guest Speakers Participate in a CTSO	Career Awareness <i>All of Level I, plus:</i> Postsecondary Visits Program- Specific Site Tours Mock Interviews	Career Preparation <i>All of Level I and II, plus:</i> Job Shadow Paid/Unpaid Internships	Career Preparation Paid/Unpaid Internships Apprenticeships

Several resources are available to help instructors meet the Level I and Level II WBL requirements, including:

Career Coach DC (<http://careercoachdc.emsicc.com>). Online site designed to help students find and connect to a career pathway by providing the most current local data on wages, employment, job postings, and associated education and training. The resource includes a Career Assessment for students.

Nepris (<https://dc.nepri.com/>). Connects educators and learners with a network of industry professionals virtually, bringing real-world relevance and career exposure to all students. Nepri also provides a skills-based volunteering platform for business and industry professionals to extend their educational outreach.

Virtual Job Shadow (<https://virtualjobshadow.com>). Provides interactive tools which empower students to discover, plan, and pursue their dreams. Rich video library presents a “day in the life of” view for thousands of occupations.

Labor Market Information Definitions and Data

Career and Technical Education programs of study in the District of Columbia must meet at least one of the High Wage, High Skill, and In-Demand definitions below to be considered appropriate for our students and the regional labor market. These definitions were created in collaboration with Career and Technical Education leaders from District of Columbia LEA’s, the University of the District of Columbia Community College, and national guidance from Research Triangle International (RTI) and Education Northwest. Additionally, previous work was consulted from researchers at MIT’s Labor Wage Index Project and the DC CTE Task Force’s 2012 Strategic Plan for the District of Columbia.



Indicator	Definition	Data for the Automotive Technology Program of Study (source: EMSI, August 2019)
<p>High Wage</p>	<p>Those occupations that have a 25th percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the District of Columbia, and/or leads to a position that pays at least the median hourly or annual wage for the Washington, DC, metropolitan statistical area.</p> <p><i>Note: A 25th percentile hourly wage of \$20.49 or greater is required to meet this definition.</i></p>	<p>Standard Occupational Code (SOC): 49-3023.00 Automotive Service Technicians and Mechanics</p> <p>Hourly Wages 25th Percentile: \$19.23 50th Percentile: \$25.74 75th Percentile: \$32.95</p>
<p>High Skill</p>	<p>Those occupations located within the Washington, DC, metropolitan statistical area with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate’s degree, or higher.</p>	<p>Typical Entry-Level Education: Postsecondary nondegree award</p>
<p>In-Demand</p>	<p>Those occupations in the Washington, DC, metropolitan statistical area having more than the median number of total (growth plus replacement) annual openings over a five-year period.</p> <p><i>Note: An occupation is required to have an annual growth plus replacement rate of 105 openings, or greater, between 2020-25 to meet this definition.</i></p>	<p>Annual Openings: 1000</p>



Model Six-Year Plan: Automotive Technology

College: University of the District of Columbia Community College

Entity: Office of the State Superintendent of Education

Program/CIP:

Career Cluster: Transportation and Logistics

Plan:

Program of Study: Automotive Technology

High School					College			
Subject	9 th Grade	10 th Grade	11 th Grade	12 th Grade	Semester I	Semester II	Semester III	Semester IV
English (4)	English I	English II	English III	English IV				
Math (4)	Algebra I	Geometry	Algebra II	Math				
Science (4)	Biology	Lab Science	Anatomy and Physiology	Science				
Social Studies (4)	World History and Geography I: Middle Ages	World History and Geography II: Modern World	U.S. History	U.S. Government (.5) and D.C. History (.5)				
Health (.5) and Physical Ed (1)	Health (.5) Physical Ed (.5)	Physical Ed (.5)						
World Languages (2)			World Language I	World Language II				
Art (.5)		Art (.5)						
Music (.5)		Music (.5)						
Elective / Major Courses	Automotive Basics	Automotive Technology I	Automotive Technology II	Practicum in Automotive Technology				
Total possible college credits completed in high school: XX					Credit hours required to complete the AAS program: XX			



Course Standards

Automotive Basics

1. **General requirements.** This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
 - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.
 - C. Automotive Basics includes knowledge of the basic automotive systems and the theory and principles of the components that make up each system and how to service these systems. Automotive Basics includes applicable safety and environmental rules and regulations. In Automotive Basics, students will gain knowledge and skills in the repair, maintenance, and servicing of vehicle systems. This study allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.
 - D. Students will participate in at least two Career Exploration Work-Based Learning experiences in this course, which might include guest speakers and work-place tours relevant to the program of study.
 - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
 - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
 1. demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);
 2. identify career and employment opportunities, including entrepreneurship opportunities, internships, and industry-recognized certification requirements for the field of automotive technology;
 3. demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;
 4. apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;
 5. discuss certification opportunities;



6. discuss response plans to emergency situations;
 7. identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and
 8. develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.
- B. The student demonstrates appropriate personal and communication skills. The student is expected to:**
1. describe, demonstrate, and apply ethical and legal responsibilities for appropriate workplace conduct;
 2. demonstrate proper etiquette and behavior;
 3. demonstrate appropriate personal appearance and hygiene;
 4. demonstrate effective written and oral communication skills and employ effective listening skills;
 5. demonstrate advanced technical writing and preparation skills; and
 6. demonstrate effective speaking skills through prepared and extemporaneous oral presentations.
- C. The student demonstrates academic skills related to the requirements of automotive technology. The student is expected to:**
1. demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;
 2. demonstrate effective written communication skills, including documenting on a repair order the customer concern/complaint, root cause of the failure, and corrective action to complete the repair; and
 3. demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate.
- D. The student understands the technical knowledge and skills of basic automotive systems. The student is expected to:**
1. describe the eight major vehicle systems;
 2. locate, read, and interpret vehicle maintenance and service information; and
 3. describe the basic and emerging vehicle power systems.
- E. The student knows the functions and applications of the tools, equipment, technologies, and materials used in automotive services. The student is expected to:**
1. demonstrate the proper way to safely use hand and power tools and equipment commonly employed in the maintenance and repair of vehicles;
 2. discuss the proper handling and disposal of environmentally hazardous materials used in servicing vehicles;
 3. identify diagnostic tools and equipment; and
 4. identify hand and shop tools and describe their proper usage.
- F. The student applies technical knowledge and skills in simulated or actual work situations. The student is expected to:**
1. demonstrate the procedures for ordering and locating parts;
 2. demonstrate an understanding of the operation theory of internal combustion engines;
 3. identify brake system components, including drum, disc, power assist, and anti-lock braking system (ABS);
 4. demonstrate an understanding of basic concepts related to hydraulic brakes systems, including Pascal's Theory of Hydraulics;



5. demonstrate an understanding of basic concepts related to electrical and electronic systems such as Ohm's law, voltage drop, resistance, amperage, voltage, and wiring diagram symbols;
6. identify air-conditioning, heating, and accessory system components;
7. inspect and identify chassis and power train components and systems;
8. identify cooling and lubrication system components;
9. identify steering and suspension components, including power steering;
10. identify and interpret tire sidewall data information such as Department of Transportation (DOT) production date information, tire load capacity, inflation pressures, sizing description, and speed rating;
11. compare the preventative maintenance schedules for a variety of vehicles based on their use;
12. perform a preventative maintenance inspection;
13. explain and perform a "jump-start" of a vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer recommended procedures; and
14. perform regular audits and inspections to maintain compliance with safety, health, and environmental regulations.

G. The student develops technology skills. The student is expected to:

1. use technology as a tool to research, organize, evaluate, and communicate information.
2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage; integrate, evaluate, and create information to successfully function in a knowledge economy;
3. demonstrate using current and new technologies specific to the program of study, course; and/or industry; and
4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



Automotive Technology I

1. **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Automotive Basics. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
 - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.
 - C. Automotive Technology I: Maintenance and Light Repair includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. This course includes applicable safety and environmental rules and regulations. In Automotive Technology I: Maintenance and Light Repair, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.
 - D. Students will participate in at least two Career Awareness Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
 - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
 - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
 1. demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);
 2. identify career and employment opportunities, including entrepreneurship opportunities, and internships and industry-recognized certification requirements for the field of automotive technology;
 3. demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;
 4. apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;
 5. discuss certification opportunities;
 6. discuss response plans to emergency situations;
 7. identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and



8. develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.
- B. The student demonstrates academic skills related to the requirements of automotive technology. The student is expected to:**
1. demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;
 2. demonstrate effective written communication skills, including documenting on a repair order the customer concern/complaint, root cause of the failure, and corrective action to complete the repair; and
 3. demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate.
- C. The student demonstrates technical knowledge and skills related to the manufacturer preventative maintenance schedule. The student is expected to:**
1. locate the manufacturer recommended preventative maintenance schedule;
 2. perform a preventative maintenance inspection of vehicle systems, including engine, fuel, lubrication, cooling, electrical, suspension, drive train, and air-conditioning systems;
 3. describe the function of the automotive chassis components, including braking, steering, transmission, drive train, and suspension systems;
 4. locate, read, and interpret service repair information such as schematics, charts, diagrams, graphs, parts catalogs, and technical bulletins;
 5. use published specifications to diagnose component wear and determine necessary repairs;
 6. identify the appropriate oil viscosity and capacity;
 7. verify operation of the instrument panel engine warning indicators;
 8. inspect engine assembly and document findings of fuel, oil, coolant, and other leaks;
 9. perform common fastener and thread repair, including removing broken bolt, restoring internal and external threads, and repairing internal threads with thread insert;
 10. inspect, replace, and adjust drive belts, tensioners, and pulleys;
 11. perform engine oil and filter change; and
 12. explain and perform a "jump-start" of a vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer recommended procedures.
- D. The student demonstrates the functions and applications of the tools, equipment, technologies, and materials used in automotive technology. The student is expected to:**
1. demonstrate the proper use of hand and power tools and equipment commonly employed in the maintenance and repair of vehicles; and
 2. discuss the proper handling and disposal of environmentally hazardous materials used in servicing vehicles.
- E. The student applies the technical knowledge and skills related to brakes in simulated or actual work situations. The student is expected to:**
1. explains Pascal's Theory of Hydraulics as it relates to the brake system;
 2. inspect brake system components, including master cylinder, brake lines, wheel cylinders, calipers, and flexible hoses and fittings, for external leaks and proper operation;
 3. inspect, measure, and refinish brake drum diameter to manufacturer specifications;



4. remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates;
5. lubricate, reassemble, and pre-adjust brake shoes and parking brake;
6. remove, inspect for damage or wear, clean, lubricate, and reassemble pads and retaining hardware, caliper assembly, and mounting components such as slides and pins for proper operation;
7. refinish a rotor on and off a vehicle and measure final rotor thickness with manufacturer specifications;
8. retract and re-adjust caliper piston on an integral parking brake system;
9. check brake pedal travel with, and without, engine running to verify proper power booster operation;
10. check brake pedal travel with, and without, engine running to verify proper power booster operation;
11. check vacuum supply from a manifold or auxiliary pump to vacuum-type brake power booster; and
12. describe the operation of a regenerative braking system.

F. The student applies the technical knowledge and skills related to electrical systems in simulated or actual work situations. The student is expected to:

1. demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity as defined by Ohm's Law;
2. demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop, current flow, resistance, and ground circuits;
3. use wiring diagrams to trace electrical/electronic circuits;
4. demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits;
5. confirm proper battery capacity for vehicle application and perform battery capacity test;
6. perform battery state-of-charge test;
7. inspect and clean the battery, fill battery cells, and check battery cables, connectors, clamps, and hold-downs;
8. perform starter current draw test;
9. inspect and test fusible links, circuit breakers, fuses, and relays;
10. perform charging system output test;
11. inspect, adjust, or replace generator/alternator drive belts and check pulleys and tensioners for wear and belt alignment;
12. verify operation of instrument panel gauges and warning/indicator lights, and reset maintenance indicators;
13. inspect interior and exterior lamps and sockets, including headlights and auxiliary light such as fog and driving lights and replace as needed; and
14. verify windshield wiper and washer operation and replace wiper blades as needed.

G. The student applies the technical knowledge and skills related to heating and air conditioning (A/C) in simulated or actual work situations. The student is expected to:

1. identify refrigerant type and the safety and environmental concerns related to handling and storage;
2. inspect engine cooling and heater systems hoses;
3. inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets;
4. inspect A/C condenser for airflow restrictions; and
5. identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.



- H. **The student applies the technical knowledge and skills related to manual and automatic drive train and axles in simulated or actual work situations. The student is expected to:**
1. identify the different fluid types used in both an automatic and manual transmission/transaxle;
 2. identify the fluid types and capacity required by application using service information;
 3. check fluid level in a transmission or a transaxle equipped with a dip-stick;
 4. check fluid level in a transmission or a transaxle not equipped with a dip-stick;
 5. check fluid condition and inspect for leaks;
 6. drain and replace fluid and filter or filters in an automatic transmission/transaxle;
 7. drain and replace fluid in an manual transmission/transaxle; and
 8. inspect power train mounts.
- I. **The student applies the technical knowledge and skills related to engine performance in simulated or actual work situations. The student is expected to:**
1. inspect and explain the electrical/electronic components, sensors and circuits on an on board diagnostics (OBD) controlled engine;
 2. perform engine absolute manifold pressure tests such as vacuum or boost;
 3. verify engine operating temperature;
 4. remove and replace spark plugs and inspect secondary ignition components for wear and damage;
 5. describe the importance of operating all OBD II monitors for repair verification;
 6. retrieve and record diagnostic trouble codes, OBD II monitor status, and freeze frame data and clear codes when applicable;
 7. inspect, service, or replace air filters, filter housings, and intake duct work;
 8. replace fuel filter or filters;
 9. inspect integrity of the exhaust manifolds, exhaust pipes, mufflers, catalytic converters, resonators, tail pipes, and heat shields; and
 10. inspect, test, and service positive crankcase ventilation (PCV) system and its components such as the filter/breather cap, valve, tubes, orifices, and hoses.
- J. **The student applies the technical knowledge and skills related to suspension systems and simulated or actual work situations. The student is expected to:**
1. identify and interpret tire sidewall data information such as Department of Transportation (DOT) production date information, tire load capacity, inflation pressures, sizing description, and speed rating;
 2. demonstrate tire tread depth measuring procedures using industry standards such as common tread depth gauges;
 3. demonstrate tire and wheel balance such as static and dynamic balance, and proper wheel weight selection;
 4. demonstrate tire and wheel measurements such as radial and lateral run-out in tire and wheel assembly;
 5. inspect steering linkage components and mounts such as inner and outer tie-rod ends, pitman arm, idler arm, inner rack and pinion ends, rack and pinion mounts, upper and lower ball joints, power steering pump, and hoses for leaks;
 6. remove, clean, inspect, and repack wheel bearings, properly install wheel seals, and adjust wheel bearing pre-load;
 7. inspect shock absorbers and McPherson struts for leakage and performance using jounce and rebound tests;
 8. demonstrate wheel stud replacement and installation of wheel and tire assembly with proper torquing procedure;



9. identify and test the Tire Pressure Monitoring Systems (TPMS), both the direct and indirect, for proper operation;
10. dismount and mount a tire on a wheel and reinstall the assembly, including torqueing the lug nuts; and
11. rotate tires according to manufacturer recommendations.

K. The student develops technology skills. The student is expected to:

1. use technology as a tool to research, organize, evaluate, and communicate information.
2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage; integrate, evaluate, and create information to successfully function in a knowledge economy;
3. demonstrate using current and new technologies specific to the program of study, course; and/or industry; and
4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



Automotive Technology II

1. **General requirements.** This course is recommended for students in Grades 11 and 12. Prerequisite: Automotive Technology I: Maintenance and Light Repair. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
 - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.
 - C. Automotive Technology II: Automotive Service includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. Automotive Technology II: Automotive Service includes applicable safety and environmental rules and regulations. In this course, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.
 - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which might include paid or unpaid internship experiences relevant to the program of study.
 - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
 - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
 1. demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);
 2. identify employment opportunities, including entrepreneurship opportunities and internships, and industry-recognized certification requirements for the field of automotive technology;
 3. demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;
 4. apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;
 5. discuss certification opportunities;
 6. discuss response plans to emergency situations;



7. identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and
 8. develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.
- B. The student relates core academic skills to the requirements of automotive technology. The student is expected to:**
1. demonstrate effective written communication skills throughout the course, including documenting on a repair order customer concern/compliant, root cause of the failure, and corrective action to complete the repair;
 2. estimate the cost of parts and labor operations on repair orders throughout the course, including the flat rate system;
 3. demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate; and
 4. research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- C. The student demonstrates the technical knowledge and skills that form the core of knowledge of automotive service. The student is expected to:**
1. diagnose the major components of powered vehicles;
 2. diagnose automotive chassis and driveline components;
 3. locate, read, and interpret documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair information and technical bulletins;
 4. locate the manufacturer recommended preventative maintenance schedule;
 5. perform a preventative maintenance inspection;
 6. perform common fastener and thread repair, including removing broken bolt, restoring internal and external threads, and repairing internal threads with thread insert;
 7. perform precision measurements and use published specifications to diagnose component wear and determine necessary repairs; and
 8. employ critical-thinking skills and structured problem-solving skills to diagnose vehicle malfunctions, solve problems, and make decisions.
- D. The student knows the functions and applications of the tools, equipment, technologies, and materials used in automotive technology. The student is expected to:**
1. demonstrate the proper and safe use of hand and power tools and equipment commonly employed in the maintenance and repair of vehicles;
 2. discuss and demonstrate the proper handling and disposal of environmentally hazardous materials used in servicing vehicles;
 3. demonstrate proper use of diagnostic tools and equipment; and
 4. locate, read, and interpret service repair information such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair bulletins.



- E. The student applies the technical knowledge and skills related to suspension in simulated or actual work situations. The student is expected to:**
1. inspect and replace power steering hoses and fittings;
 2. remove, clean, inspect, repack, and install wheel bearings; replace seals; install hubs; and adjust bearings;
 3. replace wheel bearing and race;
 4. disable and enable supplemental restraint system (SRS);
 5. inspect, remove, and replace shock absorbers and struts and inspect mounts and bushings;
 6. dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system (TPMS);
 7. inspect rear suspension system lateral links/arms, trailing arms, leaf springs, spring insulators, shackles, brackets, center pins, and mounting bolts;
 8. inspect tire condition and wear patterns, check for correct size and application based on load and speed rating, and adjust air pressure;
 9. perform pre-alignment inspection and measure vehicle ride height;
 10. inspect tire and wheel assembly for air loss;
 11. identify and test indirect and direct TPMSs and operation of the instrument panel lamps;
 12. demonstrate knowledge of steps required to remove and replace sensors in a TPMS; and
 13. inspect, remove, and replace front wheel drive (FWD) bearings, hubs, seals, shafts, boots, and universal/constant velocity (CV) joints.
- F. The student applies the technical knowledge and skills related to electrical systems in simulated or actual work situations. The student is expected to:**
1. demonstrate knowledge of the causes and effects from shorts, opens, and resistance in electrical/electronic circuits;
 2. measure key-off battery drain/parasitic draw;
 3. perform solder repair of electrical wiring;
 4. replace electrical connectors and terminal ends;
 5. demonstrate the ability to maintain or restore electronic memory functions;
 6. perform slow and fast battery charges according to manufacturer recommendations;
 7. identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting a vehicle battery;
 8. perform starter current draw test and starter circuit voltage drop tests and inspect and test starter relays and solenoids;
 9. remove and install a starter in a vehicle;
 10. inspect and test switches, connectors, and wires of starter control circuits;
 11. perform charging system output test;
 12. remove, inspect, and re-install alternator;
 13. identify system voltage and safety precautions associated with high-intensity discharge headlights;
 14. disable and enable airbag system for vehicle service and verify indicator lamp operation;
 15. remove and reinstall a door panel; and
 16. describe the operation of keyless entry and remote-start systems.
- G. The student applies the technical knowledge and skills related to brakes in simulated or actual work situations. The student is expected to:**



1. describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS);
 2. measure brake pedal height, reserve distance, travel, and free play;
 3. identify components of brake warning light system;
 4. bleed and flush brake system;
 5. identify and check the operation of brake stop light system; and
 6. identify traction control and vehicle stability control system components.
- H. **The student applies the technical knowledge and skills related to engine performance in simulated or actual work situations. The student is expected to:**
1. describe the importance of operating all on board diagnostics II (OBDII) monitors for repair verification;
 2. perform cylinder power balance test;
 3. perform cylinder cranking and running compression tests;
 4. perform cylinder leakage test;
 5. verify engine operating temperature;
 6. remove and replace spark plugs and inspect secondary ignition components for wear and damage; and
 7. retrieve and record diagnostic trouble codes and OBD II monitor status, freeze frame data, and clear trouble codes when applicable.
- I. **The student applies the technical knowledge and skills related to engines in simulated or actual work situations. The student is expected to:**
1. install engine covers using gaskets, seals, and sealers as required;
 2. remove and replace timing belt and verify correct camshaft timing;
 3. perform cooling system pressure and dye tests to identify leaks, check coolant condition and level, and inspect and test radiator, pressure cap, coolant recovery tank, and heater core; and
 4. remove, inspect, and replace thermostat and gasket or seal.
- J. **The student applies the technical knowledge and skills related to heating ventilation and air conditioning (HVAC) in simulated or actual work situations. The student is expected to:**
1. identify, locate, and replace cabin air filters;
 2. inspect air conditioning (A/C) condenser for airflow restrictions;
 3. identify the source of A/C system odors; and
 4. identify hybrid vehicle A/C system electrical circuits and safety precautions.
- K. **The student develops technology skills. The student is expected to:**
1. use technology as a tool to research, organize, evaluate, and communicate information.
 2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage; integrate, evaluate, and create information to successfully function in a knowledge economy;
 3. demonstrate using current and new technologies specific to the program of study, course; and/or industry; and
 4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



Practicum in Automotive Technology

1. **General requirements.** This course is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Transportation, Distribution, and Logistics Career Cluster. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
 - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.
 - C. Practicum in Transportation Systems is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as internships, mentorships, independent study, or laboratories. The Practicum can be either school lab based or worked based.
 - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which includes paid or unpaid internship, pre-apprenticeship, or apprenticeship experiences relevant to the program of study.
 - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
 - A. **The student demonstrates professional standards/employability skills as related by business and industry. The student is expected to:**
 1. identify career development and entrepreneurship opportunities related to transportation systems;
 2. identify careers in transportation systems;
 3. apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation within transportation;
 4. discuss certification opportunities;
 5. demonstrate knowledge of personal and occupational health and safety;
 6. discuss response plans to emergency situations;
 7. identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and
 8. explore career goals, objectives, and strategies as part of a plan for future career opportunities.



- B. The student demonstrates professional standards as required by business and industry. The student is expected to:**
1. adhere to policies and procedures;
 2. demonstrate positive work attitudes and behaviors, including demonstrating punctuality, time management, initiative, and cooperation;
 3. accept constructive criticism;
 4. apply ethical reasoning to a variety of situations in order to make ethical decisions;
 5. complete tasks with the highest standards to ensure quality products and services;
 6. model professional appearance, including using appropriate dress, grooming, and personal protective equipment; and
 7. comply with safety rules and regulations to maintain safe and healthy working conditions and environments in the practicum setting.
- C. The student applies concepts of critical thinking and problem solving. The student is expected to:**
1. analyze elements of a problem to develop creative and innovative solutions;
 2. critically analyze information to determine its relevance to the problem-solving task;
 3. compare and contrast alternatives using a variety of problem-solving and critical-thinking skills; and
 4. conduct technical research to gather information necessary for decision making.
- D. The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:**
1. analyze leadership characteristics related to trusting others, maintaining a positive attitude and integrity, and accepting key responsibilities in a work situation;
 2. demonstrate teamwork skills through working cooperatively with others to achieve tasks;
 3. demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;
 4. demonstrate responsibility for group and individual work tasks;
 5. establish and maintain effective working relationships in order to accomplish objectives and tasks;
 6. demonstrate effective working relationships using interpersonal skills;
 7. use positive interpersonal skills to work cooperatively with others;
 8. negotiate effectively to arrive at decisions;
 9. demonstrate respect for individuals, including those from different cultures, genders, and backgrounds; and
 10. demonstrate sensitivity to and value for diversity.
- E. The student demonstrates oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:**
1. demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions;
 2. employ verbal skills when obtaining and conveying information;
 3. use informational texts, Internet websites, and technical materials to review and apply information sources for occupational tasks;
 4. evaluate the reliability of information from informational texts, Internet websites, and technical materials and resources;
 5. interpret verbal and nonverbal cues or behaviors to enhance communication;



6. apply active listening skills to obtain and clarify information; and
7. use academic skills to facilitate effective written and oral communication.

F. The student demonstrates technical knowledge and skills required to pursue a career in the transportation systems. The student is expected to:

1. develop advanced technical knowledge and skills related to the student's personal career goals;
2. evaluate technical skill proficiencies; and
3. accept critical feedback provided by the supervisor.

G. The student develops technology skills. The student is expected to:

1. use technology as a tool to research, organize, evaluate, and communicate information.
2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage; integrate, evaluate, and create information to successfully function in a knowledge economy;
3. demonstrate using current and new technologies specific to the program of study, course; and/or industry; and
4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.