Apprenticeship and Industry Training

Automotive Service Technician

Curriculum Guide

009 (2022)

Alberta

Apprenticeship and Industry Training

ALBERTA ADVANCED EDUCATION

Automotive service technician : apprenticeship education program curriculum guide

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Automotive Service Technician
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CURRICULUM GUIDE

Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding a sponsor. Sponsors guide apprentices, and support on-the-job learning through provision of mentorship. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution (PSI) – usually a college or technical institute.

To receive their post-secondary credential, apprentices must learn theory and skills, and they must pass examinations. Criteria for the program—including the content and delivery of technical training—are developed and updated by the Registrar.

The graduate of the Automotive Service Technician apprenticeship program is an individual who will be able to:

- repair, maintain and overhaul or modify a motor vehicle
- comprehend work orders, technical bulletins and estimates, and relate the information to the job at hand
- interpret warranty policy in terms of service reports, component failures and analysis records
- perform assigned tasks in accordance with quality and production standards required by industry

After earning journeyperson certification, the Automotive Service Technician may opt to specialize in the repairing, rebuilding and servicing of any one or more of the many assemblies of the modern automobile.

Executive and supervisory opportunities in the automotive industry are frequently available to trained and certified automotive service technicians with above average capabilities and motivation.

It is advantageous for the Automotive Service Technician to be familiar with the work experience of closely allied trades; eg. Heavy Equipment Technician, Auto Body Technician, Machinist and Welder.

Apprenticeship and Industry Training System

Alberta's apprenticeship education programs are supported by industry stakeholders that ensures a highly skilled, internationally competitive workforce in the province. The Registrar establishes the educational standards and provides direction to the system supported by industry and the PSI's. The Ministry of Advanced Education provides the legislative framework and administrative support for the apprenticeship and industry training system.

Special thanks are offered to the following industry members who contributed to the development of the standard:

Mr. K. Alguire ..... Calgary
Mr. J. Roberts ..... Red Deer
Mr. R. Baas ..... Calgary
Mr. R. Schramm ..... Grande Prairie
Mr. W. Sjostrom ..... Edmonton
Mr. D. Smith ..... Brooks
Mr. B. Boutin ..... Edmonton
Mr. R. Bunz ..... Calgary
Mr. S. Klassen ..... Blackfalds
Mr. J. McDougall ..... Slave Lake

Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and sponsors
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprentice Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, sponsors, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Occupational Health and Safety

Persons engaged in, or supporting an individual in an experiential learning environment are often exposed to more worksite hazards than in other forms of traditional postsecondary education and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety-OHS (a division of Alberta Labour and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.alberta.ca/occupational-health-safety.aspx

Technical Training

Apprenticeship technical training is delivered by the PSI's throughout Alberta. The PSI's are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All PSI's place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all professions.

The PSI's work with industry and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs across the province. They develop curriculum from the curriculum guides established by the Registrar in consultation with the PSI's and industry and provide the technical training to apprentices.

The following PSI's deliver Automotive Service Technician trade apprenticeship technical training:

Northern Alberta Institute of Technology (Main campus)
Medicine Hat College
Lethbridge College
Southern Alberta Institute of Technology (Main campus)
Grande Prairie Regional College (Fairview campus)
Lakeland College
Red Deer College

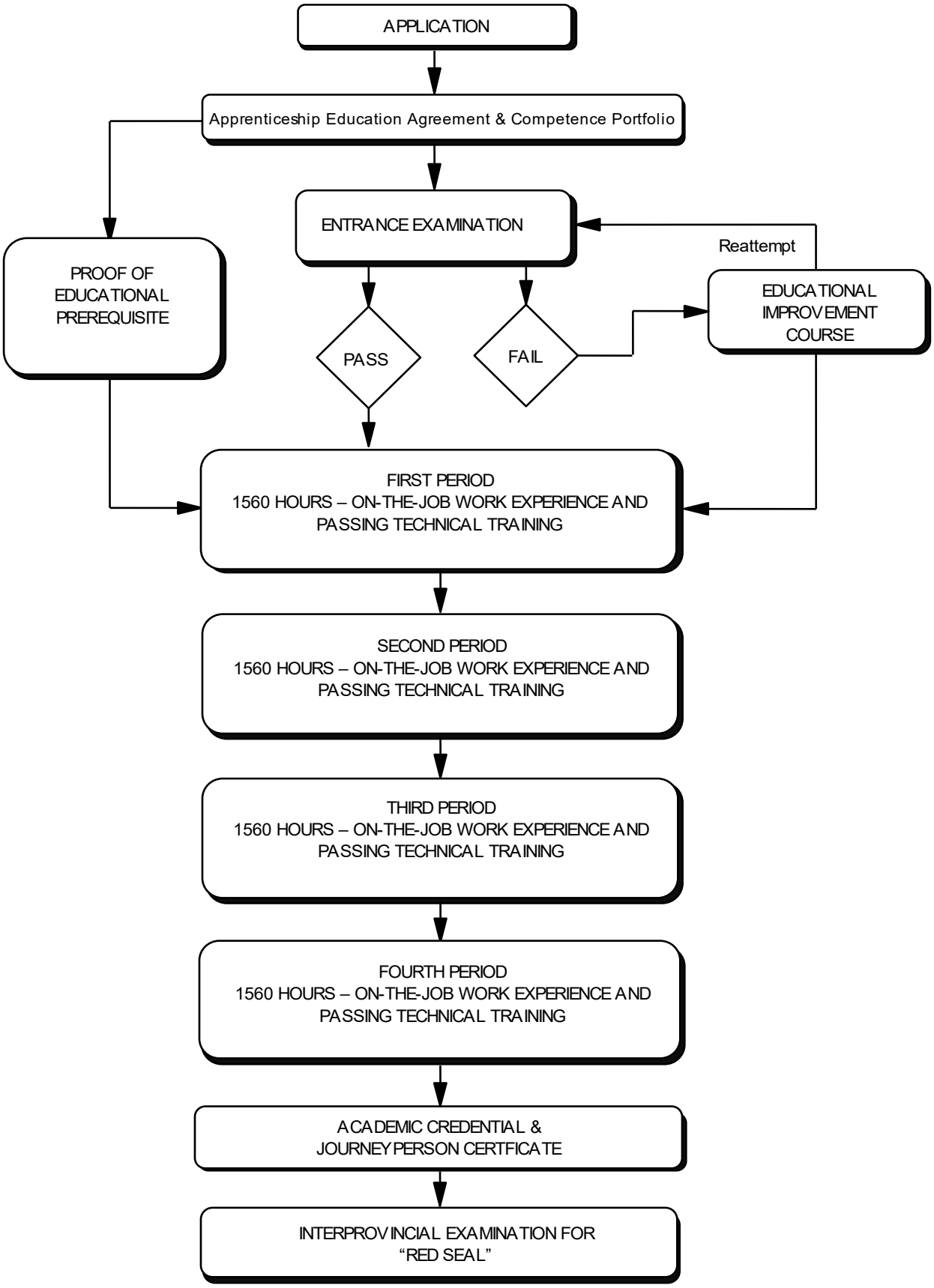
Procedures for Recommending Revisions to the Curriculum Guide

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Registrar of Apprenticeship Programs
c/o Apprenticeship Delivery and Industry Support Services
Apprenticeship Delivery and Industry Support
Advanced Education
19th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used.

Apprenticeship Route toward Academic Credential



Automotive Service Technician Training Profile
First Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

SAFETY, MATERIALS AND TOOLS **18%**

A	B	C
Safety Legislation, Regulations & Industry Policy in the Trades 10%	Climbing, Lifting, Rigging and Hoisting 7%	Hazardous Materials & Fire Protection 7%
D	**E**	**F**
Communication 2%	Measuring Tools 23%	Specialty Hand Tools 14%
G	**H**	**I**
Fastening Devices 7%	Electronic Service Information 7%	Oxy-Acetylene Heating and Cutting 23%

SECTION TWO

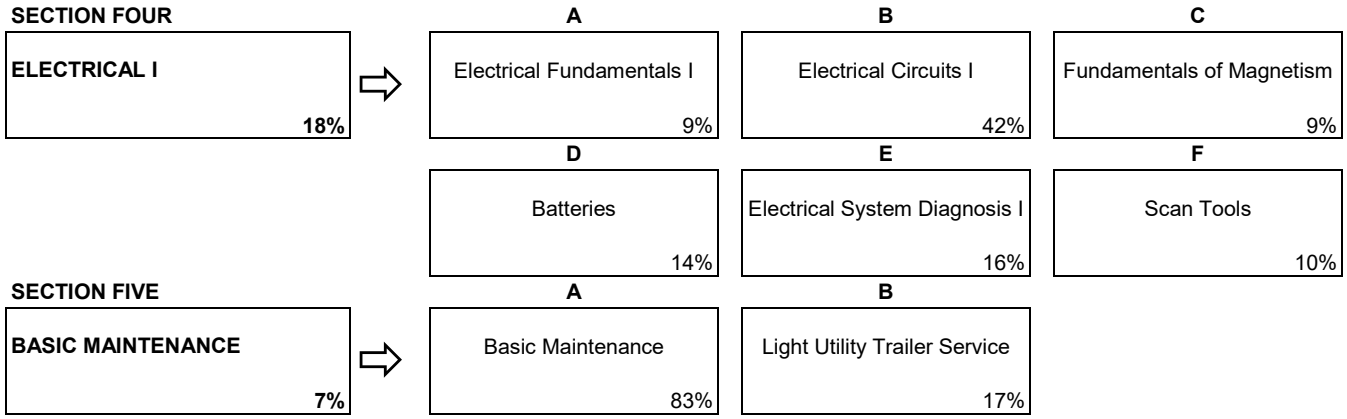
SUSPENSION AND STEERING **39%**

A	B	C
Frames 3%	Suspension and Steering Linkage Systems 14%	Wheels, Hubs and Tires 13%
D	**E**	**F**
Electric Assist Steering 6%	Hydraulic Assist Steering 13%	Steering Angles 10%
G	**H**	**I**
Alignment Procedures 16%	Steering Columns 5%	Suspension and Steering Diagnosis 10%
J		
Drive Shafts 10%		

SECTION THREE

BRAKE SYSTEMS **18%**

A	B	C
Brake System Fundamentals 11%	Hydraulic System Components 26%	Drum Brake Systems 19%
D	**E**	**F**
Disc Brake Systems 19%	Power Brakes 11%	Brake System Diagnosis and Service 14%



Automotive Service Technician Training Profile
Second Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

ENGINES — **42%**

A	B	C
Engine Fundamentals 6%	Blocks and Related Components 6%	Crankshafts, Friction, Bearings and Related Components (Theory) 6%
D	**E**	**F**
Crankshafts, Friction, Bearings and Related Components (Service) 3%	Pistons, Piston Rings and Connecting Rods (Theory) 6%	Pistons, Piston Rings and Connecting Rods (Service) 3%
G	**H**	**I**
Camshafts and Valve Trains (Theory) 10%	Camshafts and Valve Trains (Service) 6%	Cylinder Head Assemblies (Theory) 6%
J	**K**	**L**
Cylinder Head Assemblies (Service) 6%	Engine Assembly and Disassembly Procedures 9%	Air Induction Systems 4%
M	**N**	**O**
Exhaust Systems 3%	Lubrication Systems 6%	Cooling Systems 8%
P		
Engine Diagnosis 12%		

SECTION TWO

MANUAL TRANSMISSIONS, TRANSAXLES & CLUTCHES — **11%**

A	B	C
Manual Transmission Fundamentals 31%	Manual Transmissions 31%	Manual Transaxles 15%
D		
Clutches 23%		

SECTION THREE

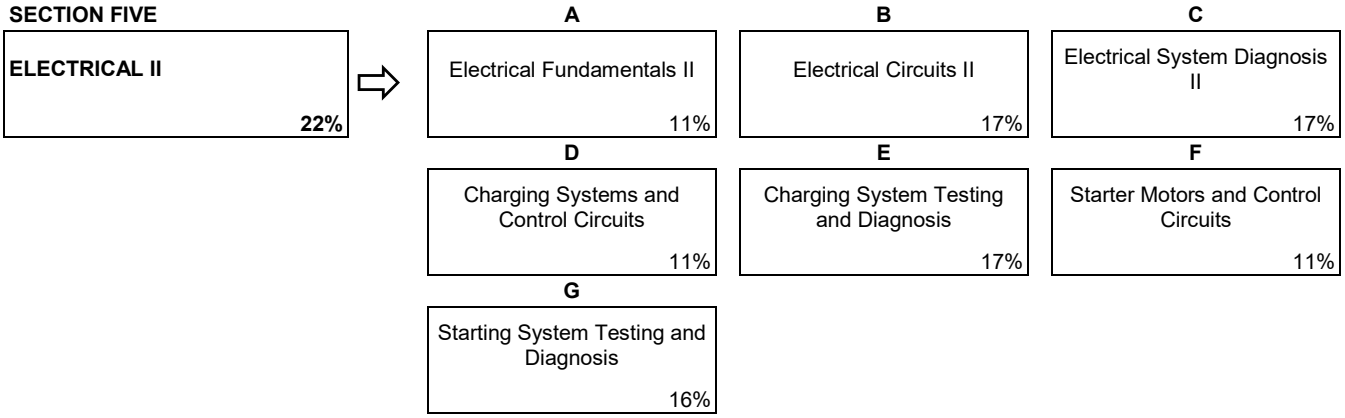
TRANSFER CASES — **8%**

A	B	C
Manual Transfer Cases 17%	Electronic Transfer Cases 33%	All Wheel Drive (AWD) Transfer Cases 33%
D		
Four Wheel Drive (4WD) Axle Controls 17%		

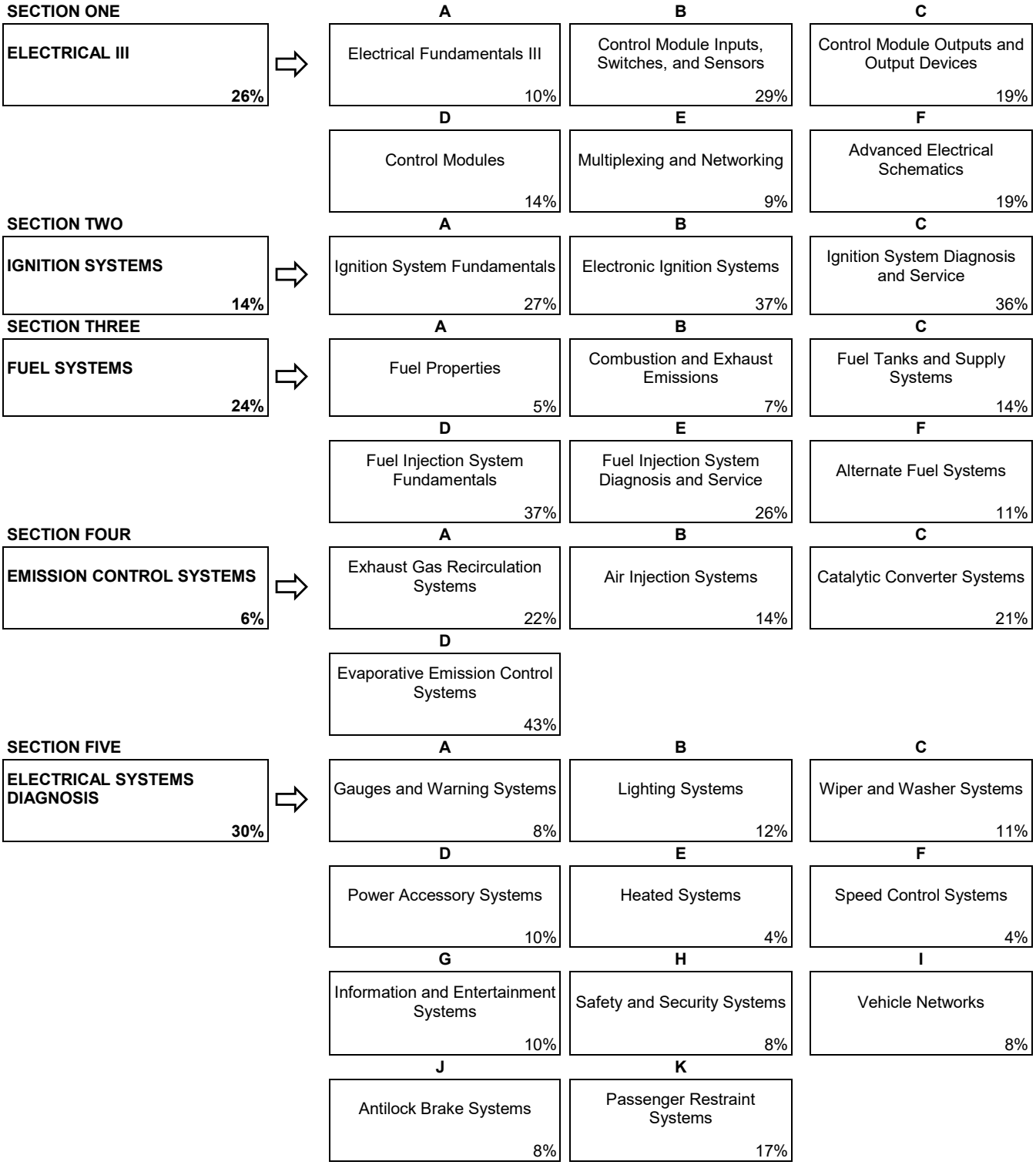
SECTION FOUR

DRIVE AXLE ASSEMBLIES — **17%**

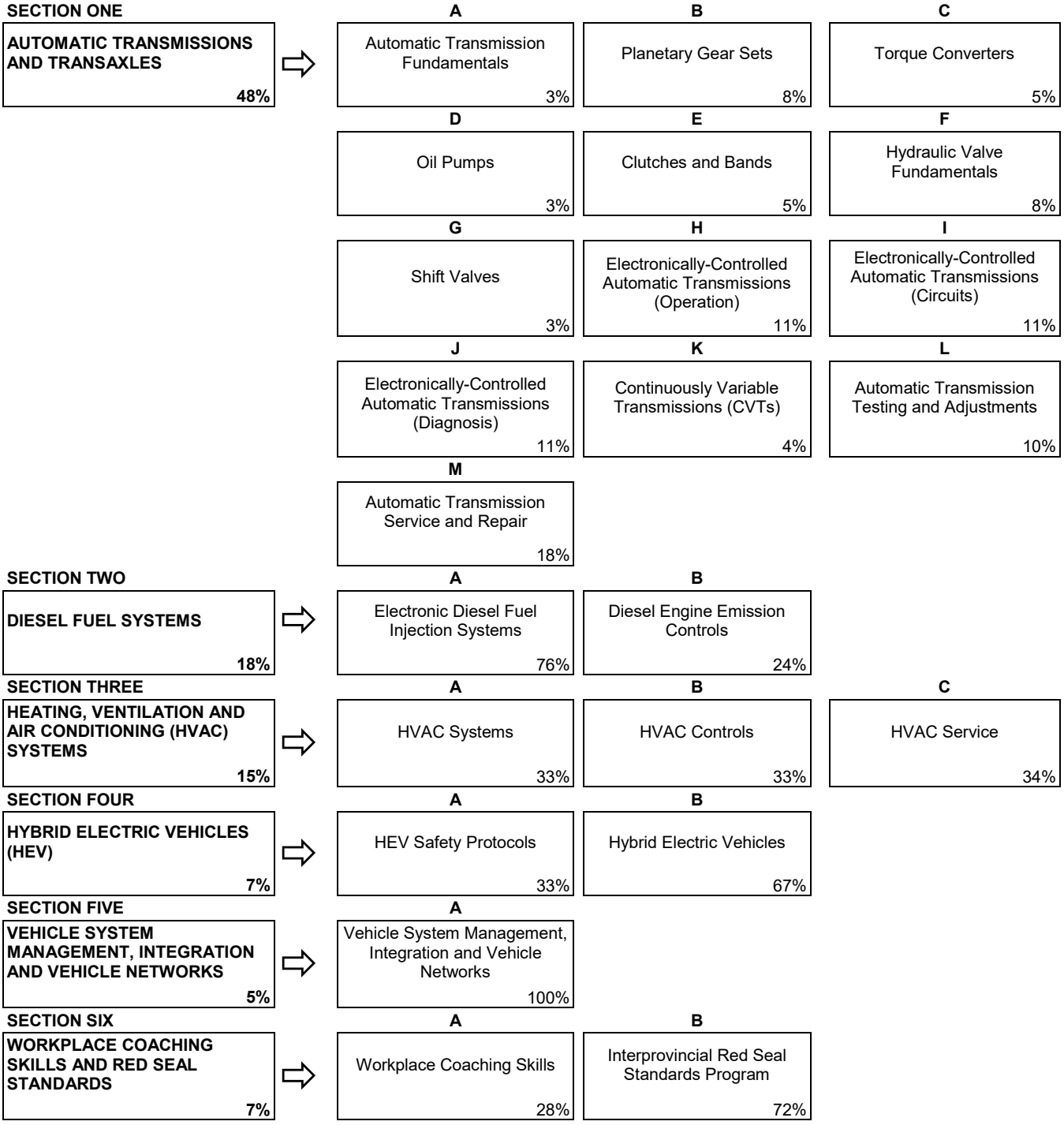
A	B	C
Axles and Bearings 14%	Differentials 21%	Final Drive Gear Sets 10%
D	**E**	
Final Drive Gear Set Assembly 19%	Drive Axle Assembly Diagnosis and Service 36%	



Automotive Service Technician Training Profile
Third Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)



Automotive Service Technician Training Profile
Fourth Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)



FIRST PERIOD TECHNICAL TRAINING
AUTOMOTIVE SERVICE TECHNICIAN TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... SAFETY, MATERIALS AND TOOLS 18%

A. Safety Legislation, Regulations & Industry Policy in the Trades 10%

Outcome: ***Apply legislation, regulations and practices ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the sponsor's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and sponsors to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of sponsors and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting 7%

Outcome: ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection 7%

Outcome: ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Communication 2%

Outcome: Communicate with customers and related trades people using industry standard terms and units for parts and operations.

1. Name standard terms and units of measure for components and operations.
2. Effectively communicate trade related information with customers and other trades people.

E. Measuring Tools 23%

Outcome: Measure components using tools common to the trade.

1. Convert numbers between decimals and fractions.
2. Perform linear measurements in imperial units.
3. Perform linear measurements in SI units.
4. Use and care for measuring tools.
5. Perform torque measurements in imperial and SI units.

F. Specialty Hand Tools 14%

Outcome: Use specialty hand tools common to the trade.

1. Perform double lap and SI tube flaring.
2. Use drills, taps and dies.
3. Demonstrate thread repair and broken fastener removal.

G. Fastening Devices 7%

Outcome: Assemble components using fasteners, adhesives and sealers common to the trade.

1. Demonstrate fastening and torquing procedures using threaded fasteners.
2. Describe the use of other retaining devices (e.g. snap rings, set screws).
3. Use sealers and adhesives common to the trade.
4. Describe tools and procedures used for plastic trim fasteners.

H. Electronic Service Information 7%

Outcome: Use electronic service information from various sources when diagnosing, servicing or repairing vehicles.

1. Use electronic service information to diagnose service or repair vehicles.
2. Access vehicle repair forums for diagnostic purposes.

I. Oxyacetylene Heating and Cutting 23%

Outcome: Perform metal cutting and heating operations using oxyacetylene equipment.

1. Describe the characteristics of and handling procedures for oxygen and acetylene.
2. Demonstrate handling procedures for regulators and hoses.
3. Demonstrate the use, care and maintenance of torches and tips.
4. Perform basic cutting operations.
5. Use personal protective equipment when heating or cutting.

SECTION TWO: ..... SUSPENSION AND STEERING 39%

A. Frames 3%

Outcome: Identify automotive frame damage.

1. Identify frame damage using knowledge of frame construction and design features.
2. Perform frame checking procedures.

B. Suspension and Steering Linkage Systems 14%

Outcome: Describe components and operation of suspension and steering systems.

1. Describe the construction and design features of common suspension systems.
2. Describe the operating principles of suspension systems.
3. Identify steering linkage types and explain their operation.

C. Wheels, Hubs and Tires 13%

Outcome: Diagnose and service wheels, tires and wheel bearings.

1. Describe the construction, sizing, rating and design features of tires and wheels.
2. Describe the construction and application of wheel bearings.
3. Diagnose problems related to wheels, tires and wheel bearings.
4. Service wheels and tires.
5. Service wheel bearings.
6. Describe the purpose and operation of tire pressure monitoring systems (TPMS).
7. Diagnose and service TPMS systems.

D. Electric Assist Steering 6%

Outcome: Diagnose and repair electrically-assisted steering gear.

1. Describe the construction and operation of a manual steering rack and pinion assembly.
2. Describe the operation of an electrically-assisted rack and pinion steering system.
3. Diagnose and repair mechanical problems related to electrically-assisted steering gears.

E. Hydraulic Assist Steering 13%

Outcome: Diagnose and repair hydraulic assist steering systems.

1. Describe the construction and design of hydraulic assist steering gears.
2. Identify hydraulic assist pump types and explain their operation.
3. Describe the operation of hydraulic assist steering systems.
4. Diagnose, repair and adjust hydraulic assist non-rack and pinion steering gears.
5. Diagnose and repair hydraulic assist rack and pinion steering gears.
6. Diagnose hydraulic assist steering problems.

F. Steering Angles 10%

Outcome: Describe steering angles and how each affects vehicle handling.

1. Describe the function and effect of caster on vehicle operation.
2. Describe the function and effect of camber on vehicle operation.
3. Describe the function and effect of steering axis inclination on vehicle operation.
4. Describe the function and effect of toe on vehicle operation.
5. Describe the effect of thrust angle on vehicle operation.
6. Describe the measurement procedures for each steering angle.
7. Describe the adjustment procedures for each steering angle.

G. Alignment Procedures 16%

Outcome: Perform a wheel alignment.

1. Select the appropriate alignment settings within specifications for a given vehicle and load.
2. Perform a pre-alignment inspection and identify faulty components.
3. Perform a wheel alignment to adjust primary alignment angles.
4. Adjust steering linkage to establish the toe setting and center the steering wheel.
5. Describe a road test procedure to verify alignment or alignment problems.

H. Steering Columns 5%

Outcome: Diagnose and repair steering columns and related safety devices.

1. Describe the construction and operation of steering columns and related safety features.
2. Describe the process to disarm, remove, install and re-arm a steering column air bag.
3. Diagnose and repair steering columns and related safety devices.

I. Suspension and Steering Diagnosis 10%

Outcome: Diagnose and repair suspension systems and steering linkages.

1. Describe the diagnosis of suspension and steering problem(s).
2. Diagnose problem(s) related to suspension systems.
3. Diagnose problem(s) related to steering systems.
4. Choose an appropriate repair method to correct suspension or steering problem(s).
5. Service suspension and steering systems to correct problem(s).

J. Drive Shafts 10%

Outcome: Diagnose and repair drive shafts, universal joints and constant velocity joints.

1. Describe the construction and operation of drive shaft components.
2. Service and repair drive shaft assemblies.
3. Service and repair universal and constant velocity joints.
4. Diagnose and repair drive shaft vibration problems.

SECTION THREE: ..... BRAKE SYSTEMS 18%

A. Brake System Fundamentals 11%

Outcome: Describe brake system principles and operation.

1. Describe the operating principles of brake systems with emphasis on hydraulic forces and friction.
2. Choose the correct brake fluid for an application based on the purpose, function, and characteristics of brake fluids.
3. State Pascal's Law and its implications for brake systems.

B. Hydraulic System Components 26%

Outcome: Diagnose and repair brake system hydraulic components.

1. Describe the operating principles, construction and design features of brake master cylinders.
2. Describe the operating principles, construction and design features of wheel cylinders and calipers used in brake systems.
3. Describe the construction and design features of brake hoses and lines.
4. Describe the purpose and operation of the metering, proportioning and pressure differential valves.
5. Describe the operation of the hydraulic components when used as a system.
6. Diagnose service, adjust and repair brake system hydraulic components.

C. Drum Brake Systems 19%

Outcome: Diagnose and repair drum brake systems.

1. Describe the construction, design features and operation of drum brake system components.
2. Service, adjust and repair drum brake systems.
3. Describe the construction and design features of drum type parking brake systems.
4. Service, adjust and repair drum type park brake systems.

D. Disc Brake Systems 19%

Outcome: Diagnose and repair disc brake systems.

1. Describe the construction, operation and design features of disc brake system components.
2. Service and repair disc brake systems.
3. Describe the construction and operation of disc type parking brake systems.
4. Service, adjust and repair disc type park brake systems.

E. Power Brakes 11%

Outcome: Diagnose and repair power brakes.

1. Describe the operation of a vacuum operated power brake unit.
2. Describe the operation of hydraulically operated power brake units.
3. Demonstrate the procedures for testing a power brake unit.

4. Diagnose problems related to and repair a power brake unit.
5. Describe safety precautions needed when working on hybrid vehicle braking systems.

F. Brake System Diagnosis and Service..... 14%

Outcome: Diagnose and service brake systems.

1. Demonstrate flushing and bleeding procedures on brake systems.
2. Demonstrate a bleeding procedure for an ABS brake system.
3. Diagnose problems related to brake systems.

SECTION FOUR: .....ELECTRICAL I..... 18%

A. Electrical Fundamentals I.....9%

Outcome: Explain basic electrical principles.

1. Describe the physical qualities of insulators, conductors and semi-conductors.
2. Describe the physical qualities and units of measure used for electromotive force, current, resistance and power.

B. Electrical Circuits I..... 42%

Outcome: Perform electrical circuit measurements.

1. Use electrical symbols and basic schematics.
2. Identify the three basic circuit types and their basic electrical properties.
3. Identify and explain an open, short or grounded circuit.
4. Using Ohm's Law, calculate for any of its variables when two are known.
5. Apply Ohm's Law to a circuit to calculate voltage, current and resistance.
6. Calculate power and explain the implications of power requirements in circuit design.
7. Perform voltage drop measurements using a voltmeter.
8. Perform parasitic drain and current draw tests using an ammeter.
9. Measure electrical resistance using an ohmmeter.
10. Service electrical circuit protection devices.

C. Fundamentals of Magnetism 9%

Outcome: Explain the principles of magnetism.

1. Describe magnetism and electromagnetism, and their properties.
2. Describe the construction and operation of electromagnetic coils.
3. Describe how magnetism or electromagnetism can change electrical energy into mechanical energy.
4. Describe how magnetism or electromagnetism can change mechanical energy into electrical energy.

D. Batteries 14%

Outcome: Diagnose and service batteries.

1. Describe the purpose, construction, operation and ratings of batteries.
2. Test and service batteries.
3. Diagnose problems related to batteries.
4. Perform battery charging and boosting operations.

E. Electrical System Diagnosis I 16%

Outcome: Diagnose and repair simple electrical circuits.

1. Use test equipment to test simple circuits and interpret results.
2. Perform simple wire and connector repairs.
3. Understand the hazards associated with electrostatic discharge (ESD) when working on vehicle electronic systems.

F. Scan Tools 10%

Outcome: Use generic, manufacturer-specific or laptop-based scan tools and software.

1. Use scan tools to retrieve diagnostic trouble codes and data, clear codes, reset warning systems and perform function tests.
2. Interpret scan data related to first period automotive systems.

SECTION FIVE: ..... BASIC MAINTENANCE 7%

A. Basic Maintenance 83%

Outcome: Describe basic maintenance routines for vehicles.

1. Identify and describe the functions and characteristics of engine oils, transmission fluids and gear oils.
2. Describe procedures for disposal of coolant, lubricants and filters.
3. Service engine air filters and cabin air filters, oil filters and fuel filters.
4. Describe safe and environmentally sensitive handling and storage practices for gasoline and diesel fuels.
5. Identify and describe the functions and characteristics of engine coolants.
6. Inspect, replace and adjust accessory drive belts.
7. Describe basic procedures for replacing lubricants and coolants.
8. Describe the purpose for maintenance schedules and reset maintenance minders.
9. Describe a maintenance inspection process.

B. Light Utility Trailer Service 17%

Outcome: Describe service procedures for light utility trailers.

1. Describe the operation of electric brakes on light utility trailers.
2. Describe the service procedures for electric brakes on light utility trailers.
3. Describe wheel bearing service procedures for light utility trailers.

SECOND PERIOD TECHNICAL TRAINING
AUTOMOTIVE SERVICE TECHNICIAN TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:..... ENGINES 42%

A. Engine Fundamentals 6%

Outcome: Describe the operation of internal combustion engines.

1. Identify and explain common engine classifications, terms and definitions.
2. Describe the principles of engine operation of four stroke cycle engines.
3. Compare physical and operational differences between engines that using different fuels.

B. Engine Blocks 6%

Outcome: Determine the serviceability of an engine block.

1. Describe the purpose, construction and design features of the block and related components.
2. Identify types of cylinder sleeves/liners and state their purpose.
3. Inspect and measure engine blocks.
4. Describe the service options to repair worn engine blocks.

C. Crankshafts, Friction Bearings and Related Components (Theory) 6%

Outcome: Describe crankshaft and friction bearing function, design and construction.

1. Describe the function, design features and operating principles of crankshafts.
2. Describe the function, characteristics and design features of friction bearings and explain how bearings are constructed.
3. Describe the function, design features and operating principles of balance shafts, auxiliary shafts, flywheels and harmonic balancers.

D. Crankshafts, Friction Bearings and Related Components (Service) 3%

Outcome: Inspect and measure a crankshaft, friction bearings and related components.

1. Inspect and measure a crankshaft to determine service worthiness.
2. Describe service procedures for crankshafts, friction bearings, shafts, flywheels, and harmonic balancers.

E. Pistons, Piston Rings and Connecting Rods (Theory) 6%

Outcome: Describe the function of pistons and related components.

1. Describe the function, construction and design features of pistons and piston pins.
2. Describe the function, construction and design features of piston rings.
3. Describe the function, construction and design features of connecting rods.
4. Describe how pistons, piston rings and piston pins are lubricated.
5. Describe how piston mass and connecting rod balance are critical to engine balance.

F. Pistons, Piston Rings and Connecting Rods (Service) 3%

Outcome: Inspect and measure pistons and related components.

1. Measure and inspect pistons, connecting rods, piston pins and rings to ensure correct fit.
2. Describe the service procedures for connecting rods.

G. Camshafts and Valve Trains (Theory) 10%

Outcome: Describe camshaft and valve train operation.

1. Describe the construction, design and functions of valve train components.
2. Describe different methods for metering lubricating oil in the valve train.
3. Describe the operation of drive mechanisms for timing camshafts.
4. Describe the operation of variable valve timing mechanisms.

H. Camshafts and Valve Trains (Service) 6%

Outcome: Diagnose camshafts and valve train components.

1. Measure, test and inspect camshafts and lifters.
2. Measure, test and inspect valve train drive mechanisms.
3. Measure, test and inspect rocker arms, push rods and other valve train components.
4. Diagnose and repair variable valve timing systems.

I. Cylinder Head Assemblies (Theory) 6%

Outcome: Describe the operation and function of cylinder head assemblies.

1. Describe the purpose of combustion chamber designs used in gasoline and/or diesel engines.
2. Describe the purpose, construction and design of cylinder heads.
3. Describe the purpose, function and design of valves, valve springs and associated hardware.
4. Describe the purpose, function and design of valve guides and valve seats.

J. Cylinder Head Assemblies (Service) 6%

Outcome: Inspect and measure cylinder heads and related components.

1. Inspect and measure cylinder heads, valves, valve guides, valve seats and valve springs.
2. Assemble a cylinder head.

K. Engine Disassembly and Assembly Procedures 9%

Outcome: Disassemble and assemble engines and attached components.

1. Disassemble an engine.
2. Assemble an engine.

L. Air Induction Systems 4%

Outcome: Diagnose and repair air induction systems and related components.

1. Identify the type of induction system used on an engine.
2. Describe the purpose and design features of intake manifolds.

3. Describe the parts, construction and operating principles of a turbo charger and supercharger.
4. Describe the maintenance requirements and service precautions for turbo chargers and superchargers.

M. Exhaust Systems 3%

Outcome: Diagnose and repair exhaust systems.

1. Describe the function and design of exhaust system components.
2. Describe exhaust system diagnostic procedures.
3. Describe exhaust component removal and replacement procedures.
4. Demonstrate engine exhaust gas venting procedures.

N. Lubrication Systems 6%

Outcome: Diagnose and repair lubricating systems.

1. Describe the operating principles of full flow lubrication systems and related components.
2. Diagnose and repair full flow lubrication systems.
3. Describe the purpose and operation of a positive crankcase ventilation (PCV) system.
4. Diagnose and service PVC systems.

O. Cooling Systems..... 8%

Outcome: Diagnose and repair cooling systems and related components.

1. Describe the physical principles involved in heat transfer.
2. Describe the purpose, construction and operation of cooling systems and related components.
3. Diagnose, and repair problems related to cooling systems and related components.

P. Engine Mechanical Diagnosis 12%

Outcome: Diagnose engine mechanical problems.

1. Diagnose common engine mechanical problems using engine test equipment.
2. Describe the importance of using the physical senses when diagnosing engine problems.

SECTION TWO: .....MANUAL TRANSMISSIONS, TRANSAXLES AND CLUTCHES 11%

A. Manual Transmission Fundamentals 31%

Outcome: Describe the operating principles of a manual transmission.

1. Describe the operating principles of a manual transmission.
2. Trace the path of power through a manual transmission or transaxle in all gear ranges.
3. Identify gear designs and calculate gear ratios and torque multiplication.
4. State the lubricating requirements for a manual transmission or transaxle and explain how their internal components are lubricated.
5. Describe the operation of synchromesh units.
6. Describe the purpose and operation of shift mechanisms.
7. Identify types of bearings and seals in manual transmissions and transaxles.

B. Manual Transmissions 31%

Outcome: Diagnose a manual transmission.

1. Describe the purpose, construction and operation of a manual transmission and its components.
2. Disassemble and reassemble a manual transmission using a shop manual.
3. Adjust manual transmission linkages.
4. Diagnose problems related to manual transmissions.

C. Manual Transaxles 15%

Outcome: Diagnose a manual transaxle.

1. Describe the purpose, construction and operation of a manual transaxle and its components.
2. Describe the disassembly and reassembly of a manual transaxle.
3. Describe the adjustment of manual transaxle linkages.
4. Diagnose problems related to manual transaxles.

D. Clutches 23%

Outcome: Diagnose and repair automotive clutches.

1. Describe the operating principles of a clutch.
2. Describe the construction, design features, and function of a clutch.
3. Describe the service and adjustment of a clutch assembly.
4. Diagnose problems related to a clutch assembly.

SECTION THREE: ..... TRANSFER CASES 8%

A. Manual Transfer Cases 17%

Outcome: Diagnose manual transfer cases.

1. Describe the purpose and operation of a manual transfer case.
2. Diagnose manual transfer case problem(s).

B. Electronic Transfer Cases 33%

Outcome: Diagnose electronic transfer cases.

1. Describe the operations of electronic transfer cases.
2. Diagnose problems related to electronic transfer case shift controls.

C. All Wheel Drive (AWD) Transfer Cases 33%

Outcome: Diagnose AWD transfer cases.

1. Describe operations of AWD transfer cases and their components.
2. Diagnose problems related to AWD transfer cases.

D. Four Wheel Drive (4WD) Controls 17%

Outcome: Diagnose 4WD engagement controls.

1. Describe the purpose and operation of locking hubs and axles on four wheel drive axles.
2. Diagnose problems related to locking hubs and axles.

SECTION FOUR: ..... DRIVE AXLE ASSEMBLIES 17%

A. Axles and Bearings 14%

Outcome: Service axle shafts and bearings.

1. Identify the common types of axle shafts by bearing types and locations.
2. Describe the function of major components of a drive axle assembly.
3. Describe how axle and wheel bearings are retained, adjusted and lubricated.

B. Differentials 21%

Outcome: Describe the operation of differentials.

1. Describe the purpose, construction and operation of standard differentials.
2. Describe the purpose, construction and operation of traction enhancing differentials.
3. Perform calculations to determine the influence of a differential on output torque and speeds.
4. Describe the lubrication requirements for differentials.

C. Final Drive Gear Sets 10%

Outcome: Describe the design and operation of final drive gear sets.

1. Describe the purpose, design features and operation of final drive gear sets.
2. Classify final drive gear sets by ratio, tooth design, number of drive pinion gear bearings and carrier types.
3. Calculate final drive gear ratios.
4. Trace the path of power from the drive pinion gear to the axle.
5. Describe how the final drive gear set support bearings are lubricated.

D. Final Drive Gear Set Assembly 19%

Outcome: Assemble a final drive gear set.

1. Identify an industry acceptable contact pattern for a hypoid type crown and drive pinion gear set.
2. Demonstrate the effect that moving the drive pinion or crown gears into or out of mesh has on the contact pattern.
3. Demonstrate the use of depth gauges and explain the concept of ‘nominal depth’.
4. Perform calculations for shim selection when installing different types of drive pinion gears.

E. Drive Axle Assembly Diagnosis and Service 36%

Outcome: Diagnose and repair drive axle assemblies.

1. Diagnose problems related to drive axles.
2. Measure gear backlash, bearing preload and gear runout.
3. Interpret a hypoid type crown and pinion gear set contact pattern for diagnostic purposes.
4. Demonstrate procedure to test a traction-enhancing differential.
5. Diagnose problems related to and service all drive axle, differential case and drive pinion gear bearings and seals.

SECTION FIVE: ..... ELECTRICAL II 22%

A. Electrical Fundamentals II 11%

Outcome: Use electrical terms, formulas and meters.

1. Calculate current, voltage and resistance in a circuit.
2. Use electrical test equipment to locate opens, shorts or grounds in an electrical circuit.

B. Electrical Circuits II 17%

Outcome: Determine electrical values in a circuit.

1. Interpret electrical circuit diagrams.
2. Perform measurements of current, voltage and resistance.

C. Electrical System Diagnosis II 17%

Outcome: Diagnose electrical systems.

1. Connect scan tools to vehicles and interpret scan data on applicable second period automotive systems.
2. Use diagnostic strategies to locate open, shorts and grounds in an automotive circuit.

D. Charging Systems and Control Circuits 11%

Outcome: Describe the operation of a charging system.

1. Describe the operating principles of a generator.
2. Describe the purpose, construction and operation of a vehicle charging system and its related components.
3. Describe the purpose and operation of electronic voltage regulators.
4. Describe the purpose, construction and operation of instrument panel charge indicator/warning devices.

E. Charging System Testing and Diagnosis 17%

Outcome: Diagnose charging systems.

1. Perform common diagnostic routines on charging systems and associated wiring.
2. Interpret results and diagnose problems from data obtained from charging system diagnostic tests.

F. Starter Motors and Control Circuits 11%

Outcome: Describe the operation of a starter motor.

1. Describe the operating principles of dc motors.
2. Describe the purpose, construction and operation of starter motors and related components.
3. Using wiring diagrams, describe the operation of starter motor electrical circuits.

G. Starting System Testing and Diagnosis..... 16%

Outcome: Diagnose starting systems.

1. Perform starter system diagnostic routines, interpret results and diagnose problems from the data obtained.
2. Use sounds heard during performance of the starter motor load test to aid in starter motor diagnosis.
3. Test starting system components and associated wiring.

THIRD PERIOD TECHNICAL TRAINING
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UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

IT IS EXPECTED THAT APPRENTICES WILL USE SCAN TOOLS, LAB SCOPES, LAPTOP SOFTWARE AND OTHER ADVANCED ELECTRONIC TEST EQUIPMENT IN THE DIAGNOSIS AND REPAIR OF VEHICLE SYSTEMS.

SECTION ONE: ELECTRICAL III 26%

A. Electrical Fundamentals III 10%

Outcome: Use electrical diagnostic aids and test procedures.

1. Interpret electrical circuit diagrams.
2. Use electrical test equipment to identify and locate high resistance, shorts and opens.

B. Control Module Inputs, Switches and Sensors 29%

Outcome: Describe and test input devices.

1. Describe how and where discrete switches are used as control modules.
2. Identify types of sensor classification (inductive, resistive, etc.),
3. Describe the operation and application of commonly used sensors.
4. Describe the term “feedback loop” and how sensors are used in a feedback system.
5. Test sensors and switches according to sensor/switch type.

C. Control Module Outputs and Output Devices 19%

Outcome: Describe and test output devices.

1. Describe the operation and application of common output devices, including solenoids, relays, lamps and motors.
2. Describe how output devices interacting with control modules can be used to control a variety of vehicle systems.
3. Test output devices according to output type.

D. Control Modules 14%

Outcome: Describe the operation of automotive control modules

1. Describe the functions of a processor in an electronic control module.
2. Describe how control modules interact with inputs, outputs and other control modules to control a component, circuit or system
3. Describe the operation and applications of diodes, transistors, capacitors and inductors

E. Multiplexing and Networking 9%

Outcome: Describe the operation of vehicle networks.

1. Describe the purpose of the data stream.
2. Describe the function and types of multiplexing.

3. Describe how multiplex wiring is used in a vehicle network.

F. Advanced Electrical Diagrams 19%

Outcome: Interpret wiring diagrams and related information to evaluate advanced circuit operation.

1. Use manufacturers' wiring diagrams and related information to verify advanced circuit operation.
2. Analyze symptoms to identify circuit faults.
3. Use wiring diagram information to select test procedures to isolate circuit faults.

SECTION TWO: ..... IGNITION SYSTEMS 14%

A. Ignition System Fundamentals 27%

Outcome: Describe the operation of an ignition system.

1. Describe the purpose, construction and operation of an ignition system and its related components.
2. State how ionization and induction apply to ignition systems.
3. Describe the operation of a basic distributor type ignition system.

B. Electronic Ignition Systems 37%

Outcome: Describe the operation of electronic ignition systems.

1. Describe the function of an ignition module and its related components.
2. Describe the essential wiring connections to an ignition module.
3. Describe how a computer interacts with sensors and outputs to control an ignition system.
4. Identify the sensor inputs and output devices essential to computer controlled ignition system operation.
5. Describe the operation of distributorless ignition systems.

C. Ignition System Diagnosis..... 36%

Outcome: Diagnose ignition systems.

1. Test and diagnose problems related to ignition systems and related components using scan tools, lab scopes and test equipment.
2. Diagnose ignition system problems from analysis of primary or secondary waveforms.
3. Describe the procedures for removing and installing a distributor.

SECTION THREE: .....FUEL SYSTEMS..... 24%

A. Fuel Properties..... 5%

Outcome: Explain fuel properties and handling practices.

1. Describe the chemical properties of gasoline and alternate fuels.
2. Compare and contrast gasoline and alternate fuel (CNG, LPG) properties.

B. Combustion and Exhaust Emissions 7%

Outcome: Describe the combustion process and resulting emissions.

1. Describe the combustion process.
2. Identify the regulated and non-regulated emissions resulting from combustion.
3. Describe the effect on exhaust emissions caused by altering air fuel ratio, ignition timing or engine design.

C. Fuel Tanks and Supply Systems..... 14%

Outcome: Diagnose and repair fuel tanks and supply systems.

1. Describe the purpose, construction and operation of fuel tanks, lines, filters and pumps.
2. Describe the safety devices employed in fuel supply systems.
3. Describe the operation of electric fuel pump systems using wiring diagrams.
4. Describe the purpose and operation of fuel pressure regulators and accumulators.
5. Diagnose problems related to fuel tanks and supply systems.
6. Repair fuel supply system components.

D. Fuel Injection System Fundamentals 37%

Outcome: Describe the operation of fuel injection systems.

1. Describe the speed density and the mass air flow methods of air measurement, and identify the fuel injection systems where each is used.
2. Describe the purpose and operation of fuel injectors.
3. Describe the purpose, construction and operation of various common air mass measuring devices.
4. Describe the purpose and operation of common methods for controlling idle speed.
5. Describe why and how throttle position is measured.
6. Describe how and why air fuel mixtures are altered for various engine-operating conditions.
7. Identify the components necessary to operate a simple computer controlled fuel injection system.
8. Describe the function, operation, advantages and disadvantages of a throttle body fuel injection system.
9. Describe the function, operation, advantages and disadvantages of a multiport fuel injection system.
10. Describe the function, operation, advantages and disadvantages of a direct fuel injection system.

E. Fuel Injection System Diagnosis and Service 26%

Outcome: Diagnose and repair fuel injection systems.

1. Test and diagnose problems related to gasoline fuel injection systems using scan tools, lab scopes and common test equipment.
2. Test, diagnose and service fuel injectors.
3. Identify symptoms related to vacuum leaks in fuel-injected systems.
4. Demonstrate safe practices for working with fuel injectors.

F. Alternate Fuel Systems 11%

Outcome: Describe the operation of alternate fuel (compressed gas) systems.

1. Describe the operation of alternate fuel (LPG, CNG) systems.

SECTION FOUR: ..... EMISSION CONTROL SYSTEMS 6%

A. Exhaust Gas Recirculation Systems 22%

Outcome: Diagnose and repair exhaust gas recirculation systems.

1. Describe the purpose and operation of exhaust gas recirculation systems.
2. Diagnose and repair exhaust gas recirculation systems.

B. Air Injection Systems 14%

Outcome: Diagnose and repair air injection systems.

1. Describe the purpose and operation of air injection systems.
2. Diagnose and repair air injection systems.

C. Catalytic Converter Systems 21%

Outcome: Diagnose and repair catalytic converter systems.

1. Describe the purpose, construction and operation of catalytic converter systems.
2. Diagnose and repair catalytic converter systems.

D. Evaporative Emission Control Systems 43%

Outcome: Diagnose and repair evaporative emission control systems.

1. Describe the sources of evaporative emissions.
2. Describe the purpose and operation of evaporative emission control systems.
3. Diagnose and repair evaporative emission control systems.

SECTION FIVE: ..... ELECTRICAL SYSTEMS DIAGNOSIS 30%

A. Gauges and Warning Systems 8%

Outcome: Diagnose and repair instrument panel circuits and warning systems.

1. Describe the operation of instrument panel gauges.
2. Describe the operation of visual and audible warning devices.
3. Diagnose and repair problems related to warning devices.

B. Lighting Systems 12%

Outcome: Diagnose and repair vehicle lighting systems.

1. Describe the purpose and operation of vehicle lighting systems and related components.
2. Diagnose and repair faults related to vehicle lighting systems.
3. Align headlamps.

C. Wiper and Washer Systems 11%

Outcome: Diagnose and repair wiper and washer systems.

1. Describe the purpose and operation of available wiper and washer systems.
2. Diagnose and repair faults related to wiper and washer systems.

D. Power Accessory Systems 10%

Outcome: Diagnose and repair power accessories.

1. Describe the operation of power seat adjusters, power lock systems and power windows.
2. Describe the operation of power assisted trunks and side doors.
3. Diagnose and repair problems associated with power accessories.

E. Heated Systems 4%

Outcome: Diagnose and repair heated systems.

1. Describe the operation and service procedures for heated glass systems.
2. Describe the operation and service procedures for heated seats and steering wheels.
3. Diagnose and repair faults related to heated components.

F. Speed Control Systems 4%

Outcome: Diagnose and repair vehicle speed control systems.

1. Describe the operation of vehicle speed control systems.
2. Diagnose and repair problems related to vehicle speed control systems.

G. Information and Entertainment Systems 10%

Outcome: Diagnose information and entertainment systems.

1. Describe the operation of information systems.
2. Describe the operation of entertainment systems.
3. Diagnose problems related to information systems.
4. Diagnose problems related to entertainment systems.

H. Safety and Security Systems 8%

Outcome: Diagnose factory installed vehicle safety and security systems.

1. Describe the operation of anti-theft and alarm systems.
2. Describe the operation of remote systems.
3. Diagnose problems related to factory installed safety and security systems

I. Vehicle Networks 8%

Outcome: Diagnose and repair vehicle networks.

1. Diagnose and repair single fault problems related to multiplex systems.

J. Anti-lock Brake Systems (ABS) 8%

Outcome: Diagnose problems related to anti-lock brake systems.

1. Identify basic ABS components.
2. Describe the operation of an ABS system.
3. Demonstrate a diagnostic procedure for an ABS system.

K. Occupant Restraint Systems..... 17%

Outcome: Diagnose and repair occupant restraint systems.

1. Describe the operation of active restraint systems.
2. Identify the components of an active restraint system.
3. Describe the operation of passive restraint systems.
4. Identify components of a passive restraint system.
5. Diagnose and repair passive restraint systems.

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SECTION ONE:.....AUTOMATIC TRANSMISSIONS AND TRANSAXLES 48%

A. Automatic Transmission Fundamentals 3%

Outcome: Describe operating principles of an automatic transmission.

1. Describe the operating principles of an automatic transmission.

B. Planetary Gear Sets 8%

Outcome: Diagnose planetary gear sets.

1. Describe the purpose and function of a planetary gear set.
2. Describe the construction, parts and operating principles of a simple planetary gear set.
3. Identify the drive, driven and held members of a planetary gear set in all forward and reverse ranges.
4. Describe the construction, parts and operating principles of a compound planetary gear set.
5. Diagnose simple and compound planetary gear set failures.

C. Torque Converters 5%

Outcome: Diagnose torque converters.

1. Describe the purpose, parts and operation of a lock up torque converter.
2. Describe the operation of torque converter control circuits and valves.
3. Diagnose problems related to faulty torque converters, control circuits, valves and, their effects on transmission operation.

D. Oil Pumps 3%

Outcome: Diagnose and repair oil pumps.

1. Describe the function, parts and operation of a fixed displacement automatic transmission oil pump.
2. Describe the function, parts and operation of a variable displacement automatic transmission oil pump.
3. Diagnose problems related to faulty automatic transmission oil pumps.
4. Disassemble and reassemble an automatic transmission oil pump.

E. Clutches and Bands 5%

Outcome: Diagnose and repair clutches, bands and servos.

1. Describe the purpose, parts and operation of clutch assemblies, pistons and seals.
2. Describe the purpose, parts and operation of transmission bands and servo assemblies.
3. Service transmission bands and clutches.

4. Describe the symptoms of faulty clutches, bands or servos.
5. Diagnose faulty clutches, bands and servos.

F. Hydraulic Valve Fundamentals 8%

Outcome: Diagnose and repair hydraulic valves.

1. Describe the operation of simple types of hydraulic valves.
2. Describe the purpose and operation of a manual valve.
3. Diagnose manual valve problems.
4. Describe the purpose and operation of pressure regulating valves.
5. Describe how throttle opening and gear selection affect main line pressure.

G. Shift Valves 3%

Outcome: Diagnose and repair shift valves.

1. Describe the purpose, construction and operation of a shift valve.
2. Describe how various driving conditions affect the operation of a shift valve.
3. Diagnose shift valves problems and explain how the problems affect automatic transmission operation.

H. Electronically-Controlled Automatic Transmissions (Operation) 11%

Outcome: Explain the operation of electronically-controlled automatic transmissions.

1. Describe the operation of an electronically-controlled automatic transmission.
2. Describe the electronic controls used in an electronically-controlled automatic transmission.

I. Electronically-Controlled Automatic Transmissions (Circuits) 11%

Outcome: Diagnose problems related to the circuits in an electronically-controlled automatic transmission.

1. Identify basic oil circuits and use a hydraulic circuit diagram to trace the flow of oil in an electronically-controlled automatic transmission
2. Describe how one hydraulic circuit influences other hydraulic circuits.

J. Electronically-Controlled Automatic Transmissions (Diagnosis) 11%

Outcome: Diagnose problems related to electronically-controlled automatic transmission operation.

1. Diagnose electronically-controlled automatic transmission problems.

K. Continuously Variable Transmissions (CVTs) 4%

Outcome: Explain the operation of CVTs

1. Describe the operation and principles of a continuously variable transmission.
2. Describe a road test procedure for verifying operation of a CVT.

L. Automatic Transmission Testing and Adjustments 10%

Outcome: Test an automatic transmission.

1. Test and verify automatic transmission operation using scan tools, lab scopes and common test equipment.
2. Perform hydraulic pressure tests on an automatic transmission to diagnose failures.
3. Adjust bands and linkages on an automatic transmission.
4. Describe a road test procedure to verify automatic transmission operation.

M. Automatic Transmission Service and Repair 18%

Outcome: Repair automatic transmissions.

1. Describe transmission fluid flush procedures.
2. Disassemble an automatic transmission.
3. Reassemble and adjust an automatic transmission.

SECTION TWO: ..... DIESEL FUEL SYSTEMS 18%

A. Electronic Diesel Fuel Injection Systems 76%

Outcome: Diagnose and repair electronically-controlled diesel fuel injection systems.

1. Describe the chemical and combustion characteristics of diesel fuel.
2. Describe the operation and design features of common electronically-controlled diesel fuel injection systems and related components.
3. Perform on-vehicle testing of an electronically-controlled diesel fuel injector.
4. Test intake air heater systems.
5. Test an electronically-controlled glow plug.
6. Describe maintenance procedures for electronically-controlled diesel fuel injection systems.
7. Describe diagnostic and repair procedures for electronically-controlled diesel fuel injection systems.

B. Diesel Engine Emission Controls 24%

Outcome: Describe diesel engine emission controls.

1. Describe the operation of exhaust gas recirculation (EGR) systems
2. Describe the operation of diesel exhaust fluid (DEF) systems.
3. Describe the operation of particulate filters.
4. Describe the operation of catalytic converters.

SECTION THREE: .HEATING VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS 15%

A. HVAC Systems 33%

Outcome: Explain the operation of HVAC systems.

1. Identify the environmental concerns with HVAC systems.
2. Describe the principles and properties of heat.
3. Describe the properties of refrigerants and refrigerant oils.

4. Demonstrate the safety precautions when handling refrigerants and refrigerant oils.
5. Describe the function of compressors, condensers, evaporators and accumulator/dryers.
6. Describe the function of refrigerant metering devices used in HVAC systems.

B. HVAC Controls 33%

Outcome: Diagnose HVAC controls.

1. Identify and explain the operation of components used for temperature control and air distribution.
2. Describe how HVAC controls may be integrated with other vehicle systems.
3. Diagnose electronic HVAC controls by accessing on-board diagnostic capabilities.

C. HVAC Repair 34%

Outcome: Diagnose and repair HVAC systems.

1. Identify the type of refrigerant used in an HVAC system.
2. Recover, recycle and recharge HVAC systems according to legislated guidelines.
3. Repair or replace defective HVAC components.
4. Diagnose problems and outline repair procedures related to HVAC systems using common leak, pressure and temperature testing equipment.

SECTION FOUR: ..... HYBRID ELECTRIC VEHICLES (HEV) 7%

A. HEV Safety Protocols 33%

Outcome: Describe the safety hazards associated with hybrid electric vehicles (HEV).

1. Describe the safety hazards associated with servicing and testing hybrid electric vehicles.

B. Hybrid Electric Vehicles 67%

Outcome: Describe the operation of a hybrid electric vehicle.

1. Identify the variety of HEV designs on the market.
2. Describe the operation of a HEV.
3. Describe the interaction between the motor/generator and the engine during:
   a) high voltage charging
   b) traction torque
   c) kinetic energy recapture (regenerative braking or engine braking)
   d) internal combustion engine starting.

SECTION FIVE: ..... VEHICLE MANAGEMENT, INTEGRATION AND VEHICLE NETWORKS 5%

A. Vehicle System Integration 100%

Outcome: Diagnose problems associated with integrated vehicle systems.

1. Describe the impact on integrated systems caused by particular faults in a system.
2. Diagnose complex (2 or more faults) problems in vehicles with integrated systems.

SECTION SIX:..... WORKPLACE COACHING SKILLS & RED SEAL STANDARDS 7%

A. Workplace Coaching Skills..... 28%

Outcome: Use coaching skills when training an apprentice.

1. Describe the process for coaching an apprentice.

B. Interprovincial Red Seal Standards Program 72%

Outcome: Use Red Seal products to prepare for an interprovincial examination.

1. Identify Red Seal products used to develop interprovincial examinations.
2. Use Red Seal products to prepare for an interprovincial examination.

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