SKILLEDTRADES BC

PROGRAM OUTLINE

Motorcycle Mechanic (Motorcycle & Power Equipment Technician)

SKILLED TRADES BC

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MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

PROGRAM OUTLINE

APPROVED

DECEMBER 2011

BASED ON

NOA 2006

Developed by
SkilledTradesBC
Province of British Columbia

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Section 1

INTRODUCTION

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

Foreword

The Motorcycle & Power Equipment Technician Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices, as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the National Occupational Analysis for Motorcycle Mechanic and British Columbia industry and instructor Subject Matter Experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Program Outline was prepared with the advice and assistance of the Industry Steering Committee and will form the basis for further updates of the British Columbia Motorcycle & Power Technician Program and creation of the learning resources by the Automotive Training Standards Organization on behalf of SkilledTradesBC.

Each competency is to be evaluated through the use of written and/or a practical assessment in which the learner must achieve a minimum of 70% in order to receive a passing grade for that competency. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Achievement Criteria are included for those competencies that require a practical component. The intent of including Achievement Criteria in this Program Outline is to ensure consistency in the training across the many training institutes in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measureable and that they reflect the skills spelled out in the competency as those required of a competent journeyperson. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The expectation for success must also be outlined for the learner.

The performance spelled out in the Achievement Criteria is suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY
Be advised that references to the WorkSafe BC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com). Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

This Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the Automotive Training Standards Organization. Members include:

- Curtis Mackie — Western Power Sports, Service Manager
- Brad Hartwig (M.Ed.) — BCIT Instructor
- Dale Popp — School District #23 Central Okanagan Instructor
- Danny Kelly — Power Source Canada, Business Manager
- Edward Sweet — Essential Motorcycle Services, Owner
- Gary Harrison — Surfwood Supply, Owner/Manager
- Gordon Hill — Fraser Valley Yamaha, Owner/Manager/technician
- J.P. Beaudreault — G.A. Check Point Yamaha, Technician
- Jeff Mica — BCIT Instructor
- Kevin Connor — Yamaha Motor Canada Ltd, Technical Trainer
- Kimberly Reid — Trev Deeley Harley Davidson, Service Manager
- Larry Ling — Hole Shot Honda, Service Manager
- Marcie Ladubec — Orca Bay Suzuki, Technician
- Mike Charbula — BCIT Instructor
- Orlando Banman — Power Source Canada, Technical Advisor
- Patty Davin — The Repair Man, Owner/Manager
- Rome Saratan — Celtic Distributors Ltd., Manager
- Sarah vanderGracht — Essential Motorcycle Services, Service Advisor
- Sean Thompson — Honda Canada, Regional Manager
- Simon Ellock — Suzuki Canada Inc., Instructor/trainer
- Steve Cazalet — Magneto Sales, Regional Manager
- Steve Wesea — Honda Canada, Instructor/trainer
- Terry Robbins — Fraser Valley Equipment Ltd., Owner/manager
- Travis Baker — Denco Cycle, Owner/technician

Industry Subject Matter Experts retained to assist in the development of Program Outline content:

- Curtis Mackie — Western Power Sports, Service Manager
- Edward Sweet — Essential Motorcycle Services, Owner/technician
- Gary Harrison — Surfwood Supply, Owner/Manager
- Gordon Hill — Fraser Valley Yamaha, Owner/Manager/technician
- Jeff Mica — BCIT Instructor
- Kimberly Reid — Trev Deeley Harley Davidson, Service Manager
- Larry Ling — Hole Shot Honda, Service Manager
- Marcie Ladubec — Orca Bay Suzuki, Technician
- Orlando Banman — Power Source Canada, Technical Advisor
- Sarah vanderGracht — Essential Motorcycle Services, Service Advisor
- Sean Thompson — Honda Canada, Regional Manager
- Terry Robbins — Fraser Valley Equipment Ltd., Owner/manager

Industry Subject Matter Experts retained as outline reviewers:

- Jeff Mica — BCIT Instructor
- Marcie Ladubec — Orca Bay Suzuki Technician
- Orlando Banman — Power Source Canada, Technical Advisor

Facilitators:

- Lloyd Stamm — Automotive Training Standards Organization
- Kevin Cudmore — Automotive Training Standards Organization

- Lee Bouchard Automotive Training Standards Organization

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Motorcycle & Power Equipment Technician occupation.

How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
Program Assessment	Communicate program completion requirements and assessment methods	Understand the various assessment requirements for the program	Understand the various assessment requirements for the program	Understand the assessment requirements they would have to fulfill in order to challenge the program
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

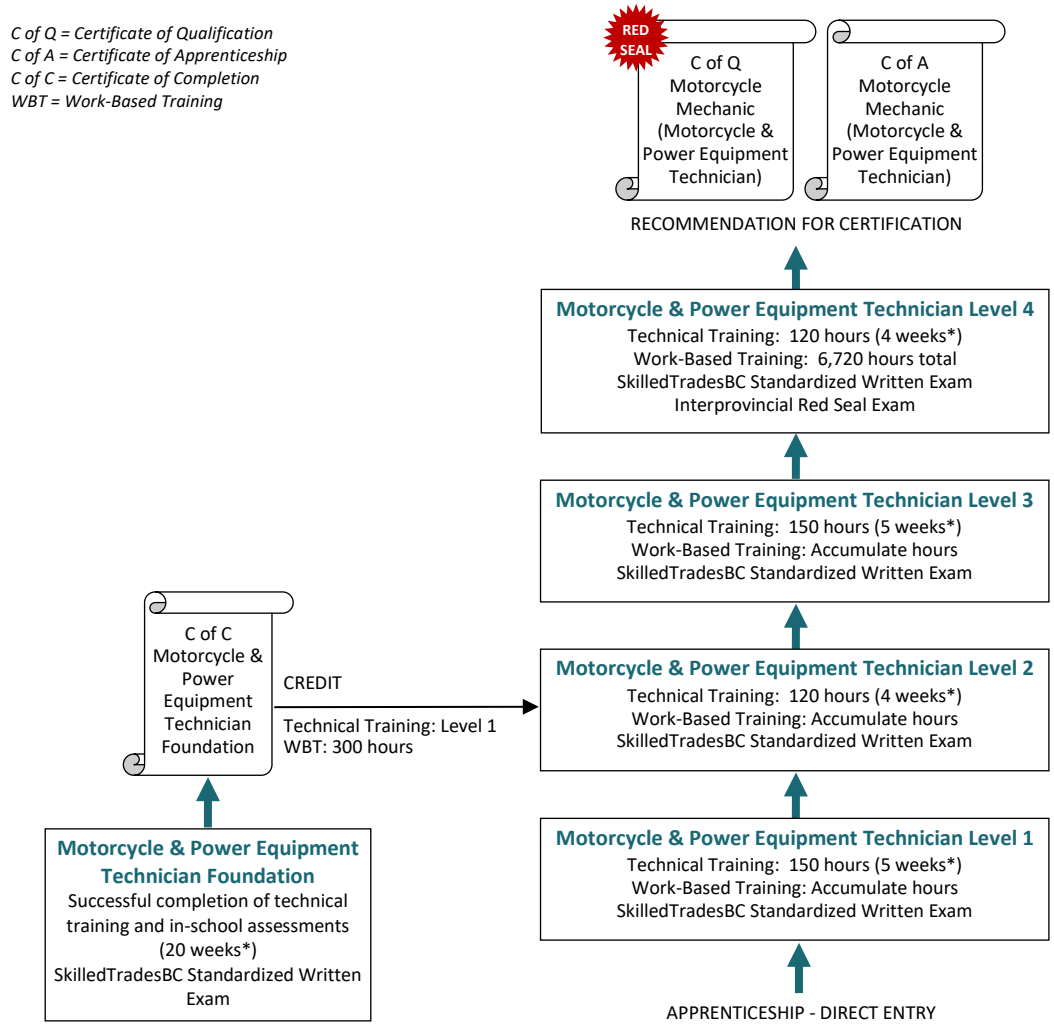
Section 2

PROGRAM OVERVIEW

Motorcycle & Power Equipment Technician

Program Credentialing Model

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship
C of C = Certificate of Completion
WBT = Work-Based Training



**Suggested duration based on 30-hour week*

CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

Program Assessment

Apprentices will be assessed fairly and accurately throughout the program on the various skills required to be a professional tradesperson. Assessment activities are designed to provide feedback and allow for further development of skills that have been identified as essential for on-the-job performance.

The forms of assessment used in this program are described below.

Completion Requirement	Evidence of Achievement	Level of Achievement Required
Level 1 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 2 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 3 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 4 Technical Training	In-school testing and practical assessment	Minimum 70%
Certificate of Qualification Exam Red Seal	SkilledTradesBC administered exam	Minimum 70%
Recommendation for Certification	Approval or sign-off by Sponsor, Employer, or other individual with sign-off authority	Declared Competent

Occupational Analysis Chart

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

Occupation Description: "Motorcycle & Power Equipment Technician" means a person who diagnoses, repairs, adjusts and replaces engines, drive trains, suspension and electrical systems on small to medium sized power products.

SAFE WORK PRACTICES A	Describe shop safety A1	Describe personal equipment safety A2	Describe fire safety A3	Apply WHMIS legislation to workplace A4		
BUSINESS PROCEDURES B	Describe workplace skills B1	Describe general shop administration B2	Describe parts inventory records and controls B3	Describe service department record keeping B4	Describe customer relations skills B5	Utilize service information B6
HAND AND SHOP TOOLS C	Identify hand tools C1	Identify shop power tools C2	Describe fastening devices C3	Utilize shop equipment C4	Introduce threading and thread repair tools C5	Identify welding safety C6
	Demonstrate equipment for heating and cutting applications C7	Introduce MIG (GMAW) welding procedures and techniques C8				
LUBRICATION AND COOLING SYSTEMS D	Describe classification of oils and greases D1	Describe two and four stroke lubrication systems D2	Describe lubrication maintenance D3	Describe lubrication and filter systems service D4	Describe two and four stroke cooling systems D5	Perform cooling system maintenance on selected units D6

	Service lubrication system on four-stroke engine D7	Service cooling system on four-stroke engine D8	Service lubrication system on two-stroke engine D9	Service cooling system on two-stroke engine D10	
	2	2	2	2	
BEARING DESIGN, CONSTRUCTION AND SERVICE E	Describe bearing design and construction E1	Describe bearing cleaning and inspection E2	Perform bearing service E3		
	1	1	1		
WHEELS, TIRES AND SUSPENSION F	Describe tire construction F1	Describe tire change and repair techniques F2	Perform tire change and repair F3	Describe wheel assemblies F4	Describe suspension systems F5	Describe wheel servicing F6
	1	1	1	1	1	3
	Service spoked wheels F7	Service solid wheels F8	Service two-piece wheels F9			
	3	3	3			
CHAIN, BELT AND SHAFT DRIVE SYSTEMS G	Describe chain drive systems G1	Describe belt drive systems G2	Describe shaft drive systems G3			
	1	1	1			
BRAKE SYSTEMS H	Describe mechanical brake systems H1	Describe theory of hydraulic brakes H2	Describe hydraulic brake and clutch systems H3	Troubleshoot mechanical and hydraulic brake systems H4	Service hydraulic brake systems H5	
	1	1	1	1	1	

ELECTRICAL AND ELECTRONICS I	Describe the principles of electricity I1	Describe electrical circuits I2	Interpret electrical diagrams I3	Use digital and analog multimeters I4	Describe storage batteries I5	Service storage batteries I6
	Describe electrical troubleshooting I7	Describe principles of electricity I8	Identify common electrical and electronic components I9	Describe ignition system types and operations I10	Service electronic distributor ignition systems I11	Service electronic ignition systems I12
	Describe computer control systems I13	Interpret wiring diagrams I14	Describe diagnostic procedures I15	Utilize electrical test equipment I16	Service computer control systems I17	Describe engine management systems I18
	Test engine management input sensors I19	Test engine management output actuators I20	Analyze on board diagnostic system data I21	Describe new vehicle technology I22		
NEW UNIT ASSEMBLY AND SERVICE PROCEDURES J	Describe pre-delivery inspection procedures J1	Perform pre-delivery inspection J2	Describe ancillary and accessory components J3	Describe unit showroom preparations J4	Perform pre-storage preparation J5	
ENGINES K	Describe engine design and combustion process K1	Describe two-cycle operation and component design K2	Describe four-cycle operation and design K3	Describe two and four-cycle selected top end component design K4	Describe four-cycle valve train component design K5	Describe counterbalace shafts K6

	Describe operating principals of diesel internal combustion engines K7	Assess engine condition K8	Service cylinder heads on four-stroke engines K9	Service valve train on four-stroke engines K10	Service cylinders and pistons on four-stroke engines K11	Service crankshaft assembly on four-stroke engines K12
	Service counterbalance assemblies on four-stroke engines K13	Service engine cases on four-stroke engines K14	Assess engine condition K15	Service cylinder heads on two-stroke engines K16	Service valve train on two-stroke engines K17	Service cylinders and pistons on two-stroke engines K18
	Service crankshaft assembly on two-stroke engines K19	Service counterbalance assemblies on two-stroke engines K20	Service engine cases on two-stroke engines K21			
GASKET AND SEAL CONSTRUCTION AND SERVICE **L**	Describe soft gasket construction and use L1	Describe hard gasket construction and use L2	Describe seal construction and use L3	Describe sealant composition and application L4		
PRECISION MEASURING INSTRUMENTS **M**	Utilize precision measuring instruments on select components M1					
EXHAUST SYSTEMS **N**	Describe exhaust system design and maintenance N1	Service two and four-stroke exhaust systems N2				

STARTING AND CHARGING SYSTEMS O	Describe starting systems O1	Service manual starting systems O2	Describe diagnosing starting systems O3	Service selected starters O4	Describe charging systems O5	Diagnose charging systems O6
	2	2	2	2	2	2
	Service selected charging systems O7					
	2					
CHASSIS AND SUSPENSION P	Describe various frame and suspension styles P1	Describe servicing select frames P2	Inspect and service select steering heads and dampers P3	Inspect and service front suspension components P4	Inspect and service rear suspension components P5	Inspect and service swing arms P6
	3	3	3	3	3	3
MANUAL TRANSMISSIONS Q	Describe clutch systems Q1	Service clutches on selected systems Q2	Describe transmission design and operation Q3	Describe shifter mechanisms and kick starter design and operation Q4	Disassemble, inspect and assess manual transmission parts Q5	
	3	3	3	3	3	
PRIMARY DRIVE SYSTEMS R	Describe various primary drive systems R1	Service primary drive chains and sprockets R2	Service primary drive belts and pulleys R3	Service primary drive shafts R4	Service power take-offs R5	
	3	3	3	3	3	
FINAL DRIVE SYSTEMS S	Describe final drive systems and variations S1	Describe final drive chains and sprockets S2	Service final drive chains and sprockets S3	Describe final drive shafts and gears S4	Service final drive shafts and gears S5	Describe final drive belts, sprockets and pulleys S6
	3	3	3	3	3	3

	Service final drive belts, sprockets and pulleys S7				
			3		
HYDRAULIC SYSTEMS T	Describe hydraulic systems and components T1	Service hydraulic pumps T2	Service hydraulic valves T3	Service hydraulic actuators T4	Utilize hydraulic schematic diagrams T5
	3	3	3	3	3
FUEL SYSTEMS U	Describe fuel types U1	Service carbureted fuel delivery components U2	Describe carburetors U3	Describe gasoline fuel injection types and controls U4	Service gasoline fuel injection components U5	Describe diesel delivery systems U6
	4	4	4	4	4	4
	Service diesel delivery systems U7	Describe alternate fuels U8	Perform fuel system tuning with an exhaust analyzer U9	Describe power enhancement equipment U10		
	4	4	4	4		
AUTOMATIC DRIVE SYSTEMS V	Describe centrifugal force clutches V1	Service selected centrifugal force clutches V2	Describe automatic transmission function V3	Service automatic transmission clutches and components V4	Describe hydrostatic drive and power steering systems V5	Service hydrostatic drive and power steering systems V6
	4	4	4	4	4	4

Training Topics and Suggested Time Allocation

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN– LEVEL 1

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**SAFE WORK PRACTICES**	**8%**	**70%**	**30%**	**100%**
A1	Describe shop safety		✓		
A2	Describe personal equipment safety		✓	✓	
A3	Describe fire safety		✓		
A4	Apply WHMIS legislation to workplace		✓	✓	
Line B	**BUSINESS PROCEDURES**	**8%**	**80%**	**20%**	**100%**
B1	Describe workplace skills		✓	✓	
B2	Describe general shop administration		✓		
B3	Describe parts inventory records and controls		✓		
B4	Describe service department record keeping		✓		
B5	Describe customer relations skills		✓	✓	
B6	Utilize service information		✓	✓	
Line C	**HAND AND SHOP TOOLS**	**20%**	**60%**	**40%**	**100%**
C1	Identify hand tools		✓	✓	
C2	Identify shop power tools		✓	✓	
C3	Describe fastening devices		✓		
C4	Utilize shop equipment		✓	✓	
C5	Introduce threading and thread repair tools		✓	✓	
C6	Identify welding safety		✓	✓	
C7	Demonstrate equipment for heating and cutting applications			✓	
C8	Introduce MIG (GMAW) welding procedures and techniques		✓	✓	
Line D	**LUBRICATION AND COOLING SYSTEMS**	**10%**	**60%**	**40%**	**100%**
D1	Describe classification of oils and greases		✓		
D2	Describe two and four stroke lubrication systems		✓		
D3	Describe lubrication maintenance		✓		
D4	Describe lubrication and filter systems service		✓	✓	
D5	Describe two and four stroke cooling systems		✓		
D6	Perform cooling system maintenance on selected units			✓	
Line E	**BEARING DESIGN, CONSTRUCTION AND SERVICE**	**4%**	**50%**	**50%**	**100%**
E1	Describe bearing design and construction		✓		
E2	Describe bearing cleaning and inspection		✓		
E3	Perform bearing service		✓	✓	

Line F	**WHEELS, TIRES AND SUSPENSION**	**12%**	**50%**	**50%**	**100%**
F1	Describe tire construction		✓		
F2	Describe tire change and repair techniques		✓		
F3	Perform tire change and repair			✓	
F4	Describe wheel assemblies		✓		
F5	Describe suspension systems		✓	✓	
Line G	**CHAIN, BELT AND SHAFT DRIVE SYSTEMS**	**4%**	**100%**	**0%**	**100%**
G1	Describe chain drive systems		✓		
G2	Describe belt drive systems		✓		
G3	Describe shaft drive systems		✓		
Line H	**BRAKE SYSTEMS**	**12%**	**50%**	**50%**	**100%**
H1	Describe mechanical brake systems		✓	✓	
H2	Describe theory of hydraulic brakes		✓		
H3	Describe hydraulic brake and clutch systems		✓		
H4	Troubleshoot mechanical and hydraulic brake systems			✓	
H5	Service hydraulic brake systems			✓	
Line I	**ELECTRICAL AND ELECTRONICS**	**16%**	**50%**	**50%**	**100%**
I1	Describe principles of electricity		✓		
I2	Describe electrical circuits		✓		
I3	Interpret electrical diagrams		✓	✓	
I4	Use digital and analog multimeters		✓	✓	
I5	Describe storage batteries		✓		
I6	Service storage batteries		✓	✓	
I7	Describe electrical troubleshooting		✓		
Line J	**NEW UNIT ASSEMBLY AND SERVICE PROCEDURES**	**6%**	**50%**	**50%**	**100%**
J1	Describe pre-delivery inspection procedures		✓		
J2	Perform pre-delivery inspection			✓	
J3	Describe ancillary and accessory components		✓		
J4	Describe unit showroom preparations		✓		
J5	Perform pre-storage preparations			✓	
	Total Percentage for Motorcycle & Power Equipment Technician Level 1	**100%**	**56%**	**44%**	

Training Topics and Suggested Time Allocation

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN– LEVEL 2

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line D	**LUBRICATION AND COOLING SYSTEMS**	**12%**	**20%**	**80%**	**100%**
D7	Service lubrication system on four-stroke engine		✓	✓	
D8	Service cooling system on four-stroke engine		✓	✓	
D9	Service lubrication system on two-stroke engine		✓	✓	
D10	Service cooling system on two-stroke engine		✓	✓	
Line K	**ENGINES**	**48%**	**30%**	**70%**	**100%**
K1	Describe engine design and combustion process		✓		
K2	Describe two-cycle operation and component design		✓		
K3	Describe four-cycle operation and design		✓		
K4	Describe two and four-cycle selected top-end component design		✓		
K5	Describe four-cycle valve train component design		✓	✓	
K6	Describe counterbalace shafts		✓	✓	
K7	Describe operating principals of diesel internal combustion engines		✓		
K8	Assess engine condition		✓	✓	
K9	Service cylinder heads on four-stroke engines		✓	✓	
K10	Service valve train on four-stroke engines		✓	✓	
K11	Service cylinders and pistons on four-stroke engines		✓	✓	
K12	Service crankshaft assembly on four-stroke engines		✓	✓	
K13	Service counterbalance assemblies on four-stroke engines		✓	✓	
K14	Service engine cases on four-stroke engines		✓	✓	
K15	Assess engine condition		✓	✓	
K16	Service cylinder heads on two-stroke engines		✓	✓	
K17	Service valve train on two-stroke engines		✓	✓	
K18	Service cylinders and pistons on two-stroke engines		✓	✓	
K19	Service crankshaft assembly on two-stroke engines		✓	✓	
K20	Service counterbalance assemblies on two-stroke engines		✓	✓	
K21	Service engine cases on two-stroke engines		✓	✓	
Line L	**GASKET AND SEAL CONSTRUCTION AND SERVICE**	**5%**	**60%**	**40%**	**100%**
L1	Describe soft gasket construction and use		✓	✓	
L2	Describe hard gasket construction and use		✓	✓	
L3	Describe seal construction and use		✓		
L4	Describe sealant composition and application		✓	✓	
Line M	**PRECISION MEASURING INSTRUMENTS**	**5%**	**0%**	**100%**	
M1	Utilize precision measuring instruments on select components			✓	
Line N	**EXHAUST SYSTEMS**	**6%**	**50%**	**50%**	**100%**
N1	Describe exhaust system design and maintenance		✓		

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
N2	Service two and four-stroke exhaust systems			✓	
Line O	**STARTING AND CHARGING SYSTEMS**	**24%**	**40%**	**60%**	**100%**
O1	Describe starting systems		✓		
O2	Service manual starting systems		✓	✓	
O3	Describe diagnosing starting systems		✓	✓	
O4	Service selected starters			✓	
O5	Describe charging systems		✓		
O6	Diagnose charging systems			✓	
O7	Service selected charging systems			✓	
	Total Percentage for Motorcycle & Power Equipment Technician Level 2	**100%**	**33%**	**67%**	

Training Topics and Suggested Time Allocation

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN– LEVEL 3

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line F	**WHEELS, TIRES AND SUSPENSION**	**8%**	**30%**	**70%**	**100%**
F6	Describe wheel servicing		✓	✓	
F7	Service spoked wheels		✓	✓	
F8	Service solid wheels		✓	✓	
F9	Service two-piece wheels		✓	✓	
Line I	**ELECTRICAL AND ELECTRONICS**	**20%**	**30%**	**70%**	**100%**
I8	Describe principles of electricity		✓		
I9	Identify common electrical and electronic components		✓	✓	
I10	Describe ignition system types and operations		✓		
I11	Service electronic distributor ignition systems		✓	✓	
I12	Service electronic ignition systems			✓	
Line P	**CHASSIS AND SUSPENSION**	**16%**	**40%**	**60%**	**100%**
P1	Describe various frame and suspension styles		✓		
P2	Describe servicing select frames		✓		
P3	Inspect and service select steering heads and dampers		✓	✓	
P4	Inspect and service front suspension components		✓	✓	
P5	Inspect and service rear suspension components		✓	✓	
P6	Inspect and service swing arms		✓	✓	
Line Q	**MANUAL TRANSMISSIONS**	**20%**	**40%**	**60%**	**100%**
Q1	Describe clutch systems		✓		
Q2	Service clutches on selected systems		✓	✓	
Q3	Describe transmission design and operation		✓	✓	
Q4	Describe shifter mechanisms and kick starter design and operation		✓		
Q5	Disassemble, inspect and assess manual transmission parts			✓	
Line R	**PRIMARY DRIVE SYSTEMS**	**10%**	**30%**	**70%**	**100%**
R1	Describe various primary drive systems		✓		
R2	Service primary drive chains and sprockets		✓	✓	
R3	Service primary drive belts and pulleys		✓	✓	
R4	Service primary drive shafts		✓	✓	
R5	Service power take-offs		✓	✓	
Line S	**FINAL DRIVE SYSTEMS**	**10%**	**40%**	**60%**	**100%**
S1	Describe final drive systems and variations		✓		
S2	Describe final drive chains and sprockets		✓		
S3	Service final drive chains and sprockets			✓	
S4	Describe final drive shafts and gears		✓		
S5	Service final drive shafts and gears			✓	
S6	Describe final drive belts, sprockets and pulleys		✓		

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
S7	Service final drive belts, sprockets and pulleys			✓	
Line T	**HYDRAULIC SYSTEMS**	**16%**	**30%**	**70%**	**100%**
T1	Describe hydraulic systems and components		✓		
T2	Service hydraulic pumps		✓	✓	
T3	Service hydraulic valves		✓	✓	
T4	Service hydraulic actuators		✓	✓	
T5	Utilize hydraulic schematic diagrams		✓	✓	
	Total Percentage for Motorcycle & Power Equipment Technician Level 3	**100%**	**30%**	**70%**	

Training Topics and Suggested Time Allocation

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN– LEVEL 4

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line I	**ELECTRICAL AND ELECTRONICS**	**34%**	**30%**	**70%**	**100%**
I13	Describe computer control systems		✓		
I14	Interpret wiring diagrams		✓	✓	
I15	Describe diagnostic procedures		✓	✓	
I16	Utilize electrical test equipment			✓	
I17	Service computer control systems			✓	
I18	Describe engine management systems		✓		
I19	Test engine management input sensors			✓	
I20	Test engine management output actuators			✓	
I21	Analyze on board diagnostic system data		✓		
I22	Describe new vehicle technology		✓		
Line U	**FUEL SYSTEMS**	**46%**	**30%**	**70%**	**100%**
U1	Describe fuel types		✓		
U2	Service carbureted fuel delivery components		✓	✓	
U3	Describe carburetors		✓		
U4	Describe gasoline fuel injection types and controls		✓	✓	
U5	Service gasoline fuel injection components			✓	
U6	Describe diesel delivery systems		✓		
U7	Service diesel delivery systems		✓	✓	
U8	Describe alternate fuels		✓		
U9	Perform fuel system tuning with an exhaust analyzer			✓	
U10	Describe power enhancement equipment		✓		
Line V	**AUTOMATIC DRIVE SYSTEMS**	**20%**	**40%**	**60%**	**100%**
V1	Describe centrifugal force clutches		✓		
V2	Service selected centrifugal force clutches			✓	
V3	Describe automatic transmission function		✓		
V4	Service automatic transmission clutches and components			✓	
V5	Describe hydrostatic drive and power steering systems		✓		
V6	Service hydrostatic drive and power steering systems			✓	
	Total Percentage for Motorcycle & Power Equipment Technician Level 4	**100%**	**30%**	**70%**	

Section 3

PROGRAM CONTENT

Motorcycle & Power Equipment Technician

Level 1

Motorcycle & Power Equipment Technician

Line (GAC): A SAFE WORK PRACTICES

Competency: A1 Describe shop safety

Objectives

To be competent in this area, the individual must be able to:

- Describe Workers' Compensation Board (WCB) applications in the workplace.
- Describe good housekeeping practices.
- Describe fire safety procedures.
- Describe Workplace Hazardous Materials Information System (WHMIS).

LEARNING TASKS	CONTENT
1. Describe WCB applications in the workplace	• WCB regulations • Personal Protective Equipment (PPE)
2. Describe good housekeeping practices	• Workplace safety and cleanliness • Ventilation • Compressed air • Hazardous material handling, storage and disposal
3. Describe fire safety procedures	• Classes of fires • Extinguisher types and uses • Fire prevention
4. Describe Workplace Hazardous Materials Information System	• Reason for WHMIS • Description of legislation • Identification

Achievement Criteria

Given a written and/or a practical assessment on safe work habits the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): A SAFE WORK PRACTICES

Competency: A2 Describe personal equipment safety

Objectives

To be competent in this area, the individual must be able to:

- Assess safety procedures and procedures for mechanical repair in shop areas.
- Apply WCB health and safety regulations to mechanical repair shop situations.
- Describe hazardous materials and their handling, storage, and disposal.

LEARNING TASKS	CONTENT
1. Assess safety procedures and procedures for mechanical repair in shop areas	• Methods and strategies to perform shop work safety • Use of personal and shop safety equipment
2. Apply WCB health and safety regulations to mechanical repair shop situations	• WCB Health and Safety Regulations • Appropriate behaviour for mechanical repair shop safety
3. Describe hazardous materials and their handling, storage, and disposal	• Solvents and caustic cleaners • Fuels • Oils and filters • Asbestos • Acids • Refrigerant • Brake fluid

Achievement Criteria:
Given a written and/or a practical assessment on personal equipment safety the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): A SAFE WORK PRACTICES

Competency: A3 Describe fire safety

Objectives

To be competent in this area, the individual must be able to:

- Describe fire classes and types.
- Describe safety precautions to prevent fires.

LEARNING TASKS	CONTENT
1. Describe fire classes and types	• Three components of fires • Class A, B, C and D fires and extinguisher types for each • Fire extinguishing
2. Describe safety precautions to prevent fires	• Handling and storage of combustible gases, liquids and solids • Electrical equipment and circuits • Develop a fire safety plan

Achievement Criteria:
Given a written and/or a practical assessment on fire safety the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): A SAFE WORK PRACTICES

Competency: A4 Apply WHMIS legislation to workplace

Objectives

To be competent in this area, the individual must be able to:

- Apply WHMIS legislation and scope.
- Describe WHMIS classification system.
- Identify WHMIS labels and symbols.
- Describe Material Safety Data Sheet (MSDS) purpose, use and location.
- Describe hazardous materials safe handling and disposal.

LEARNING TASKS	CONTENT
1. Apply WHMIS legislation and scope	• Reason for WHMIS legislation • Agencies responsible for WHMIS
2.. Describe WHMIS classification system	• Materials covered by WHMIS • WHMIS exempt materials
3. Identify WHMIS labels and symbols	• WHMIS labels • WHMIS symbols • Workplace labelling procedures
4. Describe Material Safety Data Sheet (MSDS) purpose, use and location	• Elements of MSDS • Updating of MSDS • Locations of MSDS in shop
5. Describe hazardous materials safe handling and disposal	• Environmental problems encountered in shop environment • Safe methods of handling and disposing of hazardous materials

Achievement Criteria:
Given a written and/or a practical assessment on WHMIS legislation the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B1 Describe workplace skills

Objectives

To be competent in this area, the individual must be able to:

- List workplace skills identified for Motorcycles & Power Equipment Technician.
- Describe methods of managing time and resources.
- Establish ways of performing the job efficiently.
- Identify methods of working both cooperatively and independently.
- Describe methods of rating workplace skills.
- Describe non mechanical skills and traits required in Motorcycle & Power Equipment trades.

LEARNING TASKS	CONTENT
1. List workplace skills identified for Motorcycle & Power Equipment Technician	• Eight workplace skills – Reading text – Use of documents – Writing – Numeracy – Oral communications – Thinking skills – Working with others – Computer use
2. Describe methods of managing time and resources	• Manage time effectively • Managing resources
3. Establish ways of performing the job efficiently	• Attitude versus safety • Listening carefully • Keeping records
4. Identify methods of working both cooperatively and independently	• Interpersonal relationships • Positive interpersonal skills
5. Describe methods of rating workplace skills	• Assessing workplace skills
6. Describe non mechanical skills and traits required in Motorcycle & Power Equipment trades	• Personal needs affect interaction • Methods of interpersonal communications • Positive skills and traits • Personal non mechanical strengths and weaknesses

Achievement Criteria:
Given a written and/or a practical assessment on workplace skills the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B2 Describe general shop administration

Objectives

To be competent in this area, the individual must be able to:

- Describe shop organization and control structure.

LEARNING TASKS	CONTENT
1. Describe shop organization and control structure	• Service department structure – Apprentice – Journeyperson – Service manager • Part department • Sales department • Types of pay • Service department record keeping

Achievement Criteria:
Given a written and/or a practical assessment on general shop administration the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B3 Describe parts inventory records and controls

Objectives

To be competent in this area, the individual must be able to:

- Describe parts inventory control systems.
- Describe parts records keeping.

LEARNING TASKS	CONTENT

1. Describe inventory control systems	• Work orders
	  – Internal
	  – External
	• Computer
	• Parts department
	• Shop inventory control
	• Shop supplies

2. Describe parts records keeping	• Purchase orders

Achievement Criteria:
Given a written and/or a practical assessment on parts inventory records and controls the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B4 Describe service department record keeping

Objectives

To be competent in this area, the individual must be able to:

- Describe the methods of record keeping.

LEARNING TASKS	CONTENT

1. Describe the methods of record keeping	• Work orders
	  – Internal
	  – External
	  ▪ Model
	  ▪ VIN
	  ▪ Year
	• Purchase requisitions
	• Purchase orders
	• PDI forms
	• Warranty claim forms
	• Time cards
	• Service history records
	• Service check lists
	• Maintenance schedule lists

Achievement Criteria:
Given a written and/or a practical assessment on service department record keeping the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B5 Describe customer relations skills

Objectives

To be competent in this area, the individual must be able to:

- Listen actively and decipher meanings.
- Use appropriate words and phrases.
- Use appropriate tone of voice.
- Use appropriate body language.
- Communicate by telephone.

LEARNING TASKS	CONTENT
1. Listen actively and decipher meanings	• Elements of active listening • Problem solving • Meanings
2. Use appropriate words and phrases	• Meanings of words and phrases can change • Cultural contexts
3. Use appropriate tone of voice	• Voice styles • Convey information
4. Use appropriate body language	• Personal appearance • Body language – Negative – Positive
5. Communicate by telephone	• Telephone communication skills • Acquire and relay information

Achievement Criteria:
Given a written and/or a practical assessment on customer relations skills the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): B BUSINESS PROCEDURES

Competency: B6 Utilize service information

Objectives

To be competent in this area, the individual must be able to:

- Describe service information.
- Utilize service information.

LEARNING TASKS	CONTENT
1. Describe service information	• Service information – TSB (Technical Service Bulletin) – Written forms – Safety recalls – Electronic forms – Web based
2. Utilize service information	• Service information – TSBs – Written forms – Safety recalls – Electronic forms – Web based

Achievement Criteria:
Given a written and/or a practical assessment on service information the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C1 Identify hand tools

Objectives

To be competent in this area, the individual must be able to:

- Identify and use hand tools.
- Identify torque wrench types and uses.
- Identify puller types and uses.
- Introduce precision measuring instruments.
- Describe safe procedures for using and maintaining hand tools.

LEARNING TASKS	CONTENT
1. Identify and use hand tools	• Wrenches • Socket sets • Pliers • Screwdrivers • Hammers • Punches and chisels • Impact driver • Files and hacksaws • Vises
2. Identify torque wrench types and uses	• Definition of torque • Torque wrench types and applications
3. Identify puller types and uses	• Internal and external puller types • Specialty pullers • Precautions and safety

4. Introduce precision measuring instruments	• Steel rules
	• Tapes
	• Calipers and dividers
	  – Inside
	  – Outside
	  – Dividers
	  – Vernier
	• Micrometers
	  – Inside
	  – Outside
	  – Depth
	• Telescoping gauges
	• Internal bore gauge
	• Plasti-gauge

	• Ball gauges • Feeler gauges • Dial indicator • Torque wrenches and torque sticks • Torque angle gauge
5. Describe safe procedures for using and maintaining hand tools	• Maintenance • Tool boxes • General tool precautions and safety

Achievement Criteria:
Given a written and/or a practical assessment on hand tools the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C2 Identify shop power tools

Objectives

To be competent in this area, the individual must be able to:

- Identify power tools.
- Describe safe procedures for using and maintaining power tools.
- Use power tools.

LEARNING TASKS	CONTENT
1. Describe power tools	• Drill press • Bench grinder • Electric drill • Electric impact wrenches • Pneumatic impact wrenches and ratchets • Rotary grinder
2. Describe safe procedures for using and maintaining power tools	• Electric tool maintenance • Pneumatic tool maintenance • Drill bit sharpening
3. Use power tools	• Identify metals • Construct projects

Achievement Criteria:
Given a written and/or a practical assessment on shop power tools the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C3 Describe fastening devices

Objectives

To be competent in this area, the individual must be able to:

- Describe screw thread systems.
- Describe threaded fastener designs.
- Describe other fastening devices.

LEARNING TASKS	CONTENT
1. Describe screw thread systems	• Screw thread terminology • Metric and Imperial
2. Describe threaded fastener designs	• Tensile strength • Size and thread pitch
3. Describe other fastening devices	• Washers • Keys • Pins • Locking agents • Thread lubricants

Achievement Criteria:
Given a written and/or a practical assessment on fastening devices the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C4 Utilize shop equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe safe procedures for using and maintaining general shop equipment.
- Utilize general shop equipment.

LEARNING TASKS	CONTENT
1. Describe safe procedures for using and maintaining general shop equipment	• Cleaning equipment – Solvents/parts washer – Glass bead machine – Pressure washer • Lifting equipment – Motorcycle hoists – Hydraulic jacks – Overhead cranes – Mechanical lifts – Cable and drum – Slings – Securing devices ▪ Blocking ▪ Supporting ▪ Jack stands ▪ Synching devises – Hydraulic lifts • Air Tools – Compressors – Impact Guns – Air ratchets – Air guns – Inflators • Maintenance – Cleaning – Oiling – Storage
2. Utilize general shop equipment	• Cleaning Equipment • Lifting Equipment • Safety equipment • Air Tools

Achievement Criteria:
Given a written and/or a practical assessment on shop equipment the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C5 Introduce threading and thread repair tools

Objectives

To be competent in this area, the individual must be able to:

- Identify screw thread systems.
- Identify threaded fastener design.
- Describe safe use operation and maintenance of threading and thread service tools.
- Use threading tools.

LEARNING TASKS	CONTENT
1. Identify screw thread systems	• Screw thread terminology • Metric and Imperial
2. Identify threaded fastener design	• Tensile strength • Size and thread pitch
3. Describe the safe use, operation and maintenance of threading and thread service tools	• Taps and tap wrenches • Dies and die stocks • Thread inserts • Common tapping problems • Thread repair • Broken stud removal
4. Use threading tools	• Construct projects

Achievement Criteria:
Given a written and/or a practical assessment on threading and thread repair tools the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C6 Identify welding safety

Objectives

To be competent in this area, the individual must be able to:

- Describe welding shop area rules.
- Describe general rules.
- Describe emergency procedures for the welding shop.
- Identify gasses used in cutting and welding.
- Describe safe use of cylinders, valves and safety devices.
- Identify oxygen and acetylene regulators.

LEARNING TASKS	CONTENT
1. Describe welding shop area rules	• Work clothes • Safety equipment • Personal behaviours • Cooling down times (end of day)
2. Describe general rules	• Tool and equipment treatment • Daily clean up • Awareness of hazards
3. Describe emergency procedures for the welding shop	• Firefighting equipment • First aid
4. Identify gases used in cutting and welding	• Oxygen and its storage • Acetylene and its storage • Propane and its storage
5. Describe safe use of cylinders, valves and safety devices	• Cylinders, valves and devices • Safety precautions
6. Identify oxygen and acetylene regulators	• Safety procedures

Achievement Criteria:
Given a written and/or a practical assessment on welding safety the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C7 Demonstrate equipment for heating and cutting applications

Objectives

To be competent in this area, the individual must be able to:

- Set up and shut down portable oxyacetylene outfit.
- Demonstrate torches for the use of heating.
- Demonstrate torches for the use of cutting.

LEARNING TASKS	CONTENT
1. Set up and shut down a portable oxyacetylene outfit	• Assembly • Lighting and adjusting torch • Shutting down • Disassembly
2. Demonstrate torches for the use of heating	• Proper heating technique • Proper cooling technique
3. Demonstrate torches for the use of cutting	• Lighting • Heating • Cutting

Achievement Criteria:
Given a written and/or a practical assessment on equipment for heating and cutting applications the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): C HAND AND SHOP TOOLS

Competency: C8 Introduce MIG (GMAW) welding procedures and techniques

Objectives

To be competent in this area, the individual must be able to:

- Describe GMAW process.
- Identify MIG welding equipment.

LEARNING TASKS	CONTENT
1. Describe GMAW process	• Principals • Applications • Safety precautions
2. Identify MIG welding equipment	• Unit power source • Electrical principals • Types of wire electrodes • Wire feed assemblies • Gas flow pressures and volumes

Achievement Criteria:
Given a written and/or a practical assessment on MIG (GMAW) welding procedures and techniques the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D1 Describe classification of oils and greases

Objectives

To be competent in this area, the individual must be able to:

- Describe lubrication theory.
- Describe two and four stroke lubrication needs.
- Describe SAE classification.
- Describe API classification.
- Describe classification of two stroke oils.
- Describe gear oils.
- Describe hydraulic oils.
- Describe grease types and uses.

LEARNING TASKS	CONTENT
1. Describe lubrication theory	• Friction • Petroleum based oils • Synthetic oils • Semi synthetics or blends • Environmentally safe oils – Vegetable based oil • Hydrodynamic lubrication
2. Describe two-four stroke lubrication needs	• Two stroke – Mix ratios – Injected – Pre-mixed • Four stroke – Crankcase – Reservoir
3. Describe SAE classification	• Oil functions • Viscosity • Single and multi grades • Detergent/non detergent
4. Describe API classification	• Oil additives – Teflon – Moly blend • Labelling
5. Describe classifications of two-stroke oils	• TC • TC-W
6. Describe gear oils	• SAE gear lube • API gear lube • Additives • Applications

7. Describe hydraulic oils	• SAE and API ratings • Environmentally safe oils – Vegetable based oil • Additives • Applications

8. Describe grease types and uses	• National Lubricating Grease Institute grading system
	• Soap based greases
	  – Properties
	  – Additives
	• Clay based greases
	  – Properties
	  – Additives
	• Grease additives
	• Characteristics
	• Uses

Achievement Criteria:
Given a written and/or a practical assessment on classification of oils and greases the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D2 Describe two and four stroke lubrication systems

Objectives

To be competent in this area, the individual must be able to:

- Describe two-cycle oil technology.
- Describe automatic oil injection systems.
- Describe four-cycle lubrication.
- Describe two and four-cycle lubrication system service.

LEARNING TASKS	CONTENT
1. Describe two-cycle oil technology	• Lubricant requirements • Pre-mix ratios
2. Describe automatic oil injection systems	• Design variations • Oil pumps
3. Describe four-cycle lubrication	• Splash system • Pressurized system • Oil pumps • Oil filters • Wet and dry sump • Lubrication schematics • 360˚ turn engines • Four-cycle mixed systems
4. Describe two and four-cycle lubrication system service	• Two-cycle system service requirements • Four-cycle system requirements

Achievement Criteria:
Given a written and/or a practical assessment on two and four stroke lubrication systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D3 Describe lubrication maintenance

Objectives

To be competent in this area, the individual must be able to:

- Describe lubrication maintenance.

LEARNING TASKS

1. Describe lubrication maintenance

CONTENT

- Scheduling
  - Monthly
  - Distance
  - Hourly
  - Condition (moisture)
- Filter change
  - Environment conditions
    - Normal
    - Severe
    - Extreme
- Filters
  - Oil
- Materials
  - Foam
  - Metal mesh
  - Paper
  - Oiled
  - Dry

Achievement Criteria:
Given a written and/or a practical assessment on lubrication maintenance the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D4 Describe lubrication and filter systems service

Objectives

To be competent in this area, the individual must be able to:

- Describe servicing procedure precautions.
- Describe service procedures.
- Describe filler servicing procedures.
- Perform service on select units.

LEARNING TASKS	CONTENT
1. Describe servicing procedure precautions	• Precautions – Spillage – Hot/cold drain – Over/under filling – Turbo priming – Post change leak inspection – Correct fluids
2. Describe service procedures	• Procedures – Hot/cold drain – Stepped procedures – Priming – Filling
3. Describe filter servicing procedures	• Filters – PCV – Air – Oil • Materials – Paper – Canister – Wire mesh – Ceramic – Oil bath – Oiled gauze
4. Perform services on select units	• Fluid service – Engine oil – Transmission – Differentials – Hydraulics – Brake – Clutch – Gearboxes • Procedures

- Oiled gauze

Achievement Criteria:
Given a written and/or a practical assessment on lubrication and filter systems service the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D5 Describe two and four stroke cooling systems

Objectives

To be competent in this area, the individual must be able to:

- Describe two and four-stroke air-cooling theory.
- Describe two and four-stroke liquid-cooling system theory.

LEARNING TASKS	CONTENT
1. Describe two and four-stroke air-cooling theory	• Theory – Surface area – Cooling fins – Air flow – Bellows
2. Describe two and four-stroke liquid-cooling theory	• Theory – Coolant flow – Pressurized systems – Heat dissipation • Types of cooling – Liquid – Oil • Coolant types – Ethylene glycol – Long life – Environmental safe

Achievement Criteria:
Given a written and/or a practical assessment on two and four stroke cooling systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D6 Perform cooling system maintenance on selected units

Objectives

To be competent in this area, the individual must be able to:

- Perform cooling system maintenance on selected liquid-cooled units.
- Perform cooling system maintenance on selected air-cooled units.

LEARNING TASKS	CONTENT

1. Perform cooling system maintenance on selected liquid-cooled units	• Coolant testing
	  – PH
	  – Concentration
	  – Hydrometer
	• Coolant changing
	• Thermostat testing
	• Pressure testing
	• Thermostatic switches

2. Perform cooling system maintenance on selected air-cooled units	• Air flow maintenance • Fin maintenance • Baffles • Heat shields • Cleaning procedures

Achievement Criteria:
Given a written and/or a practical assessment on cooling system maintenance on selected units the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): E BEARING DESIGN, CONSTRUCTION AND SERVICE

Competency: E1 Describe bearing design and construction

Objectives

To be competent in this area, the individual must be able to:

- Describe plain bearing technology.
- Describe rolling element bearing design and construction.
- Describe friction bearings uses and construction.
- Describe non-friction bearing uses and construction.

LEARNING TASKS	CONTENT
1. Describe plain bearing technology	• Design • Construction
2. Describe rolling element bearing design and construction	• Design type vs. load application • Component parts • Removal and replacement techniques
3. Describe friction bearings uses and construction	• Uses – Journals – Shafts • Construction – Shell – Babbitt – Bushing – Oil lite bushing
4. Describe non-friction bearing uses and construction	• Uses – Rotating shafts – Rotating axles • Construction – Single ball – Double ball – Needle – Taper roller

Achievement Criteria:
Given a written and/or a practical assessment on bearing design and construction the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): E BEARING DESIGN, CONSTRUCTION AND SERVICE

Competency: E2 Describe bearing cleaning and inspection

Objectives

To be competent in this area, the individual must be able to:

- Describe bearing cleaning and inspection.

LEARNING TASKS	CONTENT
1. Describe bearing cleaning and inspection	• Cleaning – Solvent bath – Rubber precautions • Inspection – Spalling – Overheating – Electrical pitting – Denting and brinelling – Water damage – Coolant damage

Achievement Criteria:
Given a written and/or a practical assessment on bearing cleaning and inspection the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): E BEARING DESIGN, CONSTRUCTION AND SERVICE

Competency: E3 Perform bearing service

Objectives

To be competent in this area, the individual must be able to:

- Describe bearing lubrication.
- Perform bearing service.

LEARNING TASKS	CONTENT
1. Describe bearing lubrication	• Lubrication – Oiling – Packing
2. Perform bearing service	• Cleaning – Solvent bath – Rubber precautions • Inspection – Spalling – Overheating – Electrical pitting – Denting and brinelling – Water damage – Coolant damage • Service – Packing – Preload

Achievement Criteria:
Given a written and/or a practical assessment on bearing service the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F1 Describe tire construction

Objectives

To be competent in this area, the individual must be able to:

- Describe general tire construction.
- Describe wheel rim design.
- Describe general tire codings.
- Describe tire inspection.

LEARNING TASKS	CONTENT
1. Describe general tire construction.	• Tube and tubeless • Bias ply • Radial • Rubber compounds • Foam • Directional • Plastic
2. Describe wheel rim design.	• Rim contours • Rim width and tire-size range • Security bolts
3. Describe general tire coding.	• Imperial and metric sizing • Size coding variations • Aspect ratios • Speed ratings • Load index • Ply rating • Maximum inflation pressure • Directional arrows
4. Describe tire inspection	• Inspect – Scuff patterns – Wear bar – Rubber deterioration

Achievement Criteria:
Given a written and/or a practical assessment on tire construction the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F2 Describe tire change and repair techniques

Objectives

To be competent in this area, the individual must be able to:

- Describe tire changing precautions.
- Describe tire removal and remounting.
- Describe tire repair techniques.
- Describe tire balancing.

LEARNING TASKS	CONTENT

1. Describe tire changing precautions	• Precautions
	  – Surface protection
	  ▪ Masking
	  ▪ Covers
	• Component Re&Re
	  – Fenders
	  – Shocks
	  – Bumpers
	  – Exhaust
	  – Seats
	  – Split rims
	  – Valve Stems
	  ▪ Rubber
	  ▪ Metal
	  ▪ Bent
	  ▪ Straight
	  ▪ Extended

2. Describe tire removal and remounting	• Tire deflating
	• Tire removal
	  – Tube
	  – Tubeless
	  – Split rims
	• Tire inflation precautions
	  – Bead sealing
	  – Maximum pressure
	  – Tube
	  – Tubeless
	  – Split rims

3. Describe tire repair techniques	• Hot patch • Cold patch • Plug patch • Temporary plug • Sealing liquids

4. Describe tire balancing

- Static balancing
- Dynamic balancing

Achievement Criteria:
Given a written and/or a practical assessment on tire change and repair techniques the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F3 Perform tire change and repair

Objectives

To be competent in this area, the individual must be able to:

- Perform tire removal and remounting.
- Perform tire repair techniques.
- Perform tire balancing.

LEARNING TASKS	CONTENT

1. Perform tire removal and remounting	• Tire deflating
	• Tire removal
	  – Tube
	  – Tubeless
	  – Split rims
	• Tire inflation precautions
	  – Bead sealing
	  – Maximum pressure
	  – Tube
	  – Tubeless
	  – Split rims

2. Perform tire repair techniques	• Hot patch • Cold patch • Plug patch • Temporary plug • Sealing liquids
3. Perform tire balancing	• Static balancing • Dynamic balancing

Achievement Criteria:
Given a written and/or a practical assessment on tire change and repair the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F4 Describe wheel assemblies

Objectives

To be competent in this area, the individual must be able to:

- Describe wheel assemblies.
- Describe wheel inspection.

LEARNING TASKS	CONTENT
1. Describe wheel assemblies	• Hub/bearing design • Bearing wear detection • Removal and replacement techniques
2. Describe wheel inspection	• Defects – Runout – Spoke tune – Cracking – Lug wear

Achievement Criteria:
Given a written and/or a practical assessment on wheel assemblies the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F5 Describe suspension systems

Objectives

To be competent in this area, the individual must be able to:

- Describe suspension systems.
- Describe suspension inspection.
- Describe shock absorbers/dampeners.
- Service shock absorbers.

LEARNING TASKS	CONTENT
1. Describe suspension systems	• Suspensions – Sprung weight – Unsprung weight • Types – Coil – Leaf – Torsion – Airbag – Air shock
2. Describe suspension inspection	• Ride height – Broken springs – Sagging springs
3. Describe shock absorbers/dampers	• Front • Rear • Adjustable • Non-adjustable • Air • Hydraulic • Gas filled
4. Inspect shock absorbers	• Inspection – Leaks ▪ Fluid ▪ Air • Pressure – Air – Dampening • Adjustments – Ride tension (spring) – Air (ride height)

Achievement Criteria:
Given a written and/or a practical assessment on suspension systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): G CHAIN, BELT AND SHAFT DRIVE SYSTEMS

Competency: G1 Describe chain drive systems

Objectives

To be competent in this area, the individual must be able to:

- Describe chain drive systems.
- Describe servicing chain drive systems.

LEARNING TASKS	CONTENT
1. Describe chain drive systems	• Chains – Regular – O-ring – Hyvo chains • Sprockets – Aluminum – Steel
2. Describe servicing chain drive systems	• Servicing – Identification – Inspection – Sizing – Cleaning – Tensioning – Lubing – Replacing

Achievement Criteria:
Given a written and/or a practical assessment on chain drive systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): G CHAIN, BELT AND SHAFT DRIVE SYSTEMS

Competency: G2 Describe belt drive systems

Objectives

To be competent in this area, the individual must be able to:

- Describe belt drive systems.
- Describe belt drive service.

LEARNING TASKS	CONTENT
1. Describe belt drive systems	• Belts – Cogged – Ribbed – Timed – V belt – Raw edge – Cloth wrapped • Drive mechanisms – Crank shafts – Output shafts • Idler systems
2. Describe belt drive service	• Service – Inspection – Replacement – Routing – Cleaning – Tensioning – Applications

Achievement Criteria:
Given a written and/or a practical assessment on belt drive systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): G CHAIN, BELT AND SHAFT DRIVE SYSTEMS

Competency: G3 Describe shaft drive systems

Objectives

To be competent in this area, the individual must be able to:

- Describe shaft drive systems.
- Describe service of shaft drive systems.

LEARNING TASKS	CONTENT
1. Describe shaft drive systems	• Types – Splined – Cardan (universal joint) – Slip yoke – Constant velocity
2. Describe service of shaft drive systems	• Service – Component Re&Re – Lubing – Inspection

Achievement Criteria:
Given a written and/or a practical assessment on shaft drive systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): H BRAKE SYSTEMS

Competency: H1 Describe mechanical brake systems

Objectives

To be competent in this area, the individual must be able to:

- Describe brake component operation.
- Perform brake service procedures.

LEARNING TASKS	CONTENT
1. Describe brake component operation	• Single leading shoe • Double leading shoe • Band brake • Mechanical disc brake
2. Perform brake service procedures	• Adjustment • Brake shoe removal and replacement • Cleaning procedures and precautions (asbestosis) • Component wear measurement techniques

Achievement Criteria:
Given a written and/or a practical assessment on mechanical brake systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): H BRAKE SYSTEMS

Competency: H2 Describe theory of hydraulic brakes

Objectives

To be competent in this area, the individual must be able to:

- Describe theory of hydraulic brakes.

LEARNING TASKS	CONTENT
1. Describe theory of hydraulic brakes.	• Pascal's law • Hydraulic movement – Characteristics of fluid • Pressure multiplication

Achievement Criteria:
Given a written and/or a practical assessment on theory of hydraulic brakes the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): H BRAKE SYSTEMS

Competency: H3 Describe hydraulic brake and clutch systems

Objectives

To be competent in this area, the individual must be able to:

- Describe brake fluid designations and specifications.
- Describe brake component design and operation.

LEARNING TASKS	CONTENT
1. Describe brake fluid designations and specifications	• DOT 3, 4, 5, 5.1 • Handling and storage
2. Describe brake component design and operation	• Master cylinders • Single and double acting piston callipers • Disc rotors • Hydraulic drum/shoe components

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic brake and clutch systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): H BRAKE SYSTEMS

Competency: H4 Troubleshoot mechanical and hydraulic brake systems

Objectives

To be competent in this area, the individual must be able to:

- Troubleshoot mechanical and hydraulic brake systems.

LEARNING TASKS	CONTENT
1. Troubleshoot mechanical and hydraulic brake systems	• Conditions – Squealing – Spongy – Pulsation – Fading – Lockup – Dragging – Binding – Seizing – Adjustment

Achievement Criteria:
Given a written and/or a practical assessment on mechanical and hydraulic brake systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): H BRAKE SYSTEMS

Competency: H5 Service hydraulic brake systems

Objectives

To be competent in this area, the individual must be able to:

- Perform service procedures.
- Perform component rebuilding.

LEARNING TASKS	CONTENT

1. Perform service procedures	• Pad replacement
	• Adjusting
	• Bleeding
	• Brake hose replacement
	• Disc wear/warpage
	• Fluid inspection
	  – Level
	  – Moisture

2. Perform component rebuilding	• Master cylinder disassembly/assembly • Caliper disassembly/assembly

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic brake systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I1 Describe the principles of electricity

Objectives

To be competent in this area, the individual must be able to:

- Describe electrical concepts.
- Explain sources of electricity.

LEARNING TASKS	CONTENT
1. Describe electrical concepts	• Atomic structure • Electrical charges • Electron flow • Conductors and insulators • Voltage, current and resistance
2. Explain sources of electricity	• Chemical • Magnetic

Achievement Criteria:
Given a written and/or a practical assessment on the principles of electricity the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I2 Describe electrical circuits

Objectives

To be competent in this area, the individual must be able to:

- Describe circuit components.
- Apply Ohm's law.
- Describe circuit types.

LEARNING TASKS	CONTENT
1. Describe circuit components	• Power sources • Conductors, loads, switches
2. Apply Ohm's law	• Current, voltage, and resistance calculations • Wattage
3. Describe circuit types	• Series • Parallel • Series-parallel

Achievement Criteria:
Given a written and/or a practical assessment on electrical circuits the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I3 Interpret electrical diagrams

Objectives

To be competent in this area, the individual must be able to:

- Describe circuit components.
- Identify electrical diagrams.
- Interpret electrical diagrams.

LEARNING TASKS	CONTENT

1. Describe circuit components	• Connectors
	• Switches
	• Fuses
	  – Inline
	  – Main
	  – Fuse links
	• Power
	• Supplies

2. Identify electrical diagrams	• Pictorial • Block • Schematic • Wiring
3. Interpret electrical diagrams	• Electrical symbols • Wire color codes • Switch continuity tables • Circuit tracing

Achievement Criteria:
Given a written and/or a practical assessment on electrical diagrams the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I4 Use digital and analog multimeters

Objectives

To be competent in this area, the individual must be able to:

- Describe electrical test equipment.
- Measure electrical values in series and parallel currents.

LEARNING TASKS	CONTENT

1. Describe electrical test equipment	• Digital vs. analog
	• Voltmeter
	  – AC
	  – DC
	• Ammeter
	• Ohmmeter
	• Precautions

2. Measure electrical values in series and parallel currents	• Voltage • Current • Resistance

Achievement Criteria:
Given a written and/or a practical assessment on digital and analog multimeters the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I5 Describe storage batteries

Objectives

To be competent in this area, the individual must be able to:

- Describe construction and operation of lead-acid batteries.
- Describe circuit components.

LEARNING TASKS	CONTENT
1. Describe construction and operation of lead-acid batteries	• Construction • Electrolytes • Operating cycles • Dry charged • Maintenance free • Capacity ratings
2. Describe circuit components	• Safety precautions • Battery problems • Servicing new batteries • Charging procedures • Hydrometer testing • Load testing

Achievement Criteria:
Given a written and/or a practical assessment on storage batteries the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I6 Service storage batteries

Objectives

To be competent in this area, the individual must be able to:

- Describe test procedures for lead-acid batteries.
- Perform battery service procedures.

LEARNING TASKS	CONTENT
1. Describe test procedures for lead-acid batteries	• Open circuit • Capacity • Conductivity • Parasitic draw • Surface draw
2. Perform battery service procedures	• Safety precautions • Battery problems • Servicing new batteries • Charging procedures • Hydrometer testing • Load testing

Achievement Criteria:
Given a written and/or a practical assessment on storage batteries the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I7 Describe electrical troubleshooting

Objectives

To be competent in this area, the individual must be able to:

- Describe electrical troubleshooting.
- Describe solderless connectors.
- Describe circuit repair.

LEARNING TASKS	CONTENT
1. Describe electrical troubleshooting	• Electrical faults – Grounds – High resistance – Shorts – Opens
2. Describe solderless connectors	• Wire gauges and types • Wire stripping • Connector crimping
3. Describe circuit repair	• Solder and flux types • Soldering tools • Soldering terminals and joints

Achievement Criteria:
Given a written and/or a practical assessment on electrical troubleshooting the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): J NEW UNIT ASSEMBLY AND SERVICE PROCEDURES

Competency: J1 Describe pre-delivery inspection procedures

Objectives

To be competent in this area, the individual must be able to:

- Describe assembly procedures.
- Describe pre-delivery inspection procedures new unit assembly.

LEARNING TASKS	CONTENT
1. Describe assembly procedures	• Interpret build instructions • Uncrating and assembly
2. Describe pre-delivery inspection procedures.	• Unloading safety • Reporting shipment damage • Uncrating • Assembly instructions and techniques • Safety interlocks

Achievement Criteria:
Given a written and/or a practical assessment on pre-delivery inspection procedures the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): J NEW UNIT ASSEMBLY AND SERVICE PROCEDURES

Competency: J2 Perform pre-delivery inspection

Objectives

To be competent in this area, the individual must be able to:

- Perform pre-delivery inspection (PDI) service procedures as per manufacturers' specifications.
- Perform general service procedures.

LEARNING TASKS	CONTENT
1. Perform PDI service procedures as per manufacturers' specifications	• New battery service • Cable adjustment • Lubrication and cooling system service • Fastener torque • Tire pressure • Performance test – Safety shut downs

2. Perform general service procedures	• Fluid levels
	• Steering head
	• Swing arm bearing play
	• Wheel bearing check
	• Charging system check
	• Adjustments
	  – Rod
	  – Lever
	  – Chain
	  – Tire pressure
	  – Seat
	  – Blade
	  – Deck height

Achievement Criteria:
Given a written and/or a practical assessment on pre-delivery inspection procedures the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): J NEW UNIT ASSEMBLY AND SERVICE PROCEDURES

Competency: J3 Describe ancillary and accessory components

Objectives

To be competent in this area, the individual must be able to:

- Describe ancillary components.
- Describe accessory components.

LEARNING TASKS	CONTENT
1. Describe ancillary components	• Accessories – Carburetors – Motorcycle chains – Outdoor power chains – Hubs – Ignition coils – Tires – Motorcycle lights, indicators, horns, seats – Clutch plates – Shock absorbers – Kick assemblies – Mirrors – Brake discs/pads
2. Describe accessory components.	• Accessories – Accent grilles – Bike cover – Blades – Cargo net – Chains – Custom exhaust – Digital tire gauge – Drink holder – Drive shaft cover – Exhaust wrap – Extensions – Fender tip – Files – Floorboards – Front guards & rear huggers – Grips, risers, foot pegs – Hand deflectors – Helmet lock – Intercoms & alarms – Kickstand extension – Leather seat cover

- License plate holder
- Luggage rack
- Marker lighting/signals
- Mud flaps
- Oils
- Saddlebags
- Sheers
- Stereo systems
- Tire repair kit

Achievement Criteria:
Given a written and/or a practical assessment on ancillary and accessory components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): J NEW UNIT ASSEMBLY AND SERVICE PROCEDURES

Competency: J4 Describe unit showroom preparations

Objectives

To be competent in this area, the individual must be able to:

- Describe pressure washing precautions.
- Describe tire preparation.

LEARNING TASKS	CONTENT
1. Describe pressure washing precautions	• Precautions – Ignition – Intake – Finish – Greases – Chain o-rings
2. Describe tire preparation	• Precautions – Prescribed cleaners – Prescribed areas – UV effects

Achievement Criteria:
Given a written and/or a practical assessment on unit showroom preparations the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): J NEW UNIT ASSEMBLY AND SERVICE PROCEDURES

Competency: J5 Perform pre-storage preparation

Objectives

To be competent in this area, the individual must be able to:

- Perform pre-storage preparation.

LEARNING TASKS	CONTENT
1. Perform pre-storage preparation	• Lubing the cylinders • Precautions – Appropriate storage oils – Cycling engine • Draining the carburetors • Top up the tanks • Add stabilizer • Disconnecting batteries – Full charge • Set tire pressure • Cleaning decks & blades • Loosen chains

Achievement Criteria:
Given a written and/or a practical assessment on pre-storage preparation the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Level 2

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D7 Service lubrication system on four-stroke engine

Objectives

To be competent in this area, the individual must be able to:

- Describe types of lubrication systems.
- Describe lubrication system components.
- Inspect component condition.
- Service lubrication systems.

LEARNING TASKS	CONTENT
1. Describe types of lubrication systems	• Types – Wet sump – Dry sump
2. Describe lubrication system components	• Components – Pumps – Coolers – Lines – Galleries – Reservoirs – Sensors – Pickups – Strainers – Filters – Bi-pass check valves • Sensors – Levelling – Early warning – Pressure – Temp – Thermostat • Lube jetting
3. Inspect component condition	• Diagnose failure • Pump – Gears – Chains – Dippers and slingers – Clearances • Sensors • Check valves • Galleries

4. Service lubrication systems

- Flush procedures
- Oil pressure
- Component Re&Re
- Sensor testing
- Dipper/slingers level
- Leak detection and repair

Achievement Criteria:
Given a written and/or a practical assessment on lubrication system on four-stroke engine the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D8 Service cooling system on four-stroke engine

Objectives

To be competent in this area, the individual must be able to:

- Describe cooling system types.
- Describe cooling system components.
- Inspect component condition.
- Service cooling systems.

LEARNING TASKS	CONTENT
1. Describe cooling system types	• Types – Air cooled – Liquid cooled – Combination cooled ▪ Air/oil • Test equipment – Pressure pumps – Dyes – Infrared – Hydrometers
2. Describe cooling system components	• Components – Pumps – Radiators(heat exchangers) – Lines – Jackets – Fins – Fans – Reservoirs – Sensors
3. Inspect component condition	• Pump – Gears – Chains – Clearances – Radiators (heat exchangers) • Caps • Thermostats • Belts • Fans • Sensors • Check valves

4. Service cooling systems

- Diagnose failure
- Flush procedures
- Testing radiators
- Component Re&Re
- Sensor testing
- Thermostat Testing
- Leak detection and repair
- Radiator cap testing

Achievement Criteria:
Given a written and/or a practical assessment on cooling system on four-stroke engine the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D9 Service lubrication system on two-stroke engine

Objectives

To be competent in this area, the individual must be able to:

- Describe types of lubrication systems.
- Describe lubrication system components.
- Inspect component condition.
- Service lubrication systems.

LEARNING TASKS	CONTENT
1. Describe types of lubrication systems	• Types – Pre-mix – Intake injection – Positive bearing injection
2. Describe lubrication system components	• Components – Oil injection pump drives – Oil tanks – Lines – Sensor
3. Inspect component condition	• Diagnose failure • Sensors • Check valves • Lines & passages
4. Service lubrication systems	• Flush procedures • Bleeding • Adjustments (cable action oil pump) • Component Re&Re • Sensor testing • Leak detection and repair

Achievement Criteria:
Given a written and/or a practical assessment on lubrication system on two-stroke engine the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): D LUBRICATION AND COOLING SYSTEMS

Competency: D10 Service cooling system on two-stroke engine

Objectives

To be competent in this area, the individual must be able to:

- Describe cooling system types.
- Describe cooling system components.
- Inspect component condition.
- Service cooling systems.

LEARNING TASKS	CONTENT
1. Describe cooling system types	• Types – Air cooled – Liquid cooled
2. Describe cooling system components	• Components – Pumps – Radiators (heat exchangers) – Caps – Lines – Jackets – Fins – Fans – Reservoirs – Sensors – Seals
3. Inspect component condition	• Pump – Gears – Chains – Clearances • Radiators • Caps • Seals • Thermostats • Sensors • Check valves

4. Service cooling systems

- Diagnose failure
- Flush procedures
- Testing radiators
- Component Re&Re
- Sensor testing
- Thermostat testing
- Leak detection and repair
- Replace pumps
- Replace seals

Achievement Criteria:
Given a written and/or a practical assessment on cooling system on two-stroke engine the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K1 Describe engine design and combustion process

Objectives

To be competent in this area, the individual must be able to:

- Describe construction and operation of internal combustion gasoline piston engines.
- Describe the combustion process.
- Describe engine measurements.
- Describe engine classification.

LEARNING TASKS	CONTENT
1. Describe construction and operation of internal combustion gasoline piston engines	• Component parts • Two-cycle and four-cycle • Terminology • Engine configuration
2. Describe the combustion process	• Normal combustion • Pre-ignition • Detonation
3. Describe engine measurements	• Displacement • Compression ratio • Horsepower • Torque • Efficiency
4. Describe engine classification	• Stroke cycle • Valve location • Cylinder configuration

Achievement Criteria:
Given a written and/or a practical assessment on engine design and combustion process the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K2 Describe two-cycle operation and component design

Objectives

To be competent in this area, the individual must be able to:

- Describe two-cycle operation.
- Describe two-cycle engine design variations.

LEARNING TASKS	CONTENT
1. Describe two-cycle engine operation	• Stroke cycle • Cross scavenging • Loop scavenging
2. Describe two-cycle engine design variations	• Piston port • Reed valve • Rotary valve • Direct injection • Variable height exhaust port mechanisms • Crankcase sealing

Achievement Criteria:
Given a written and/or a practical assessment on two-cycle operation and component design the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K3 Describe four-cycle operation and design

Objectives

To be competent in this area, the individual must be able to:

- Describe four-cycle operation.
- Identify valve mechanism design variations.

LEARNING TASKS	CONTENT

1. Describe four-cycle engine operation	• Stroke cycle
	• Oiling
	  – Wet sump
	  – Dry sump
	  – 360˚ oiling

2. Describe valve mechanism design variations	• Side valve • Push rod OHV • SOHC types • DOHC types • Desmodromic • Combustion chamber design • Multi-valve heads

Achievement Criteria:
Given a written and/or a practical assessment on four-cycle operation and design the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K4 Describe two and four-cycle selected top-end component design

Objectives

To be competent in this area, the individual must be able to:

- Describe piston design and construction.
- Describe piston ring design, construction and operation.
- Describe engine cylinder design and construction.

LEARNING TASKS	CONTENT
1. Describe piston design and construction	• Shape and heat expansion • Valve cutaways • Pin offset • Material types
2. Describe piston ring design, construction and operation	• Straight rail • Keystone • Dykes • Oil control • Markings • Installation • Material types
3. Describe engine cylinder design and construction	• Cast iron • Aluminum • Plated cylinder bores • Cast iron sleeves

Achievement Criteria:
Given a written and/or a practical assessment on two and four-cycle selected top-end component design the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K5 Describe four-cycle valve train component design

Objectives

To be competent in this area, the individual must be able to:

- Describe poppet valve assembly design and operation.
- Describe four-cycle camshaft design and configuration.
- Describe designs for valve clearance adjustment.
- Describe OHC drive types and tensioners.

LEARNING TASKS	CONTENT
1. Describe poppet valve assembly design and operation	• Terminology • Springs, keepers, retainers • Valve seats • Guides • Spring seats • Seals • Desmodromic
2. Describe four-cycle camshaft design and configuration	• Lift and duration • Cam to crankshaft timing • Decompressors • Variable valve actuation • Desmodromic
3. Describe designs for valve clearance adjustment	• Rocker arm/cam follower tappet screw • Eccentric rocker shaft • Adjustable push rod • Shim/cam follower • Shim over and under bucket • Hydraulic tappet
4. Describe OHC drive types and tensioners	• Chain, belt and gear drives • Automatic, semi-automatic and manual tensioners • Tension adjustment procedures

Achievement Criteria:
Given a written and/or a practical assessment on four-cycle valve train component design the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K6 Describe counterbalance shafts

Objectives

To be competent in this area, the individual must be able to:

- Describe counterbalance shaft drive types and tensioners.
- Describe counterbalance shafts operation.

LEARNING TASKS	CONTENT
1. Describe counterbalace shaft drive types and tensioners	• Drives – Chain – gear • Tensioners – Automatic – Semi-automatic – Manual • Tension adjustment procedures
2. Describe counterbalace shafts operation	• Terminology – Counter force – Timing – Timing marks

Achievement Criteria:
Given a written and/or a practical assessment on counterbalance shafts the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K7 Describe operating principles of diesel internal combustion engines

Objectives

To be competent in this area, the individual must be able to:

- Describe operating principles of diesel internal combustion.

LEARNING TASKS	CONTENT
1. Describe the operating principles of a diesel engine	• Four-stroke cycle • Compression ignition • Compression ratio • Intake manifold design • Forced induction • Compare component construction to gasoline combustion engines • Engine measurements • Horse power • Torque • Volumetric efficiency • Thermal efficiency

Achievement Criteria:
Given a written and/or a practical assessment on operating principles of diesel internal combustion the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K8 Assess engine condition

Objectives

To be competent in this area, the individual must be able to:

- Introduce diagnostic measuring tools.
- Describe engine assessment.
- Utilize diagnostic measuring instruments.
- Describe engine tear-down and inspection.

LEARNING TASKS	CONTENT
1. Introduce diagnostic measuring tools	• Leak down monitor • Fuel pressure gauge • Oil pressure gauge • Compression gauge • Vacuum gauge • Manometer
2. Describe engine assessment	• Assessments – Compression ▪ Dry ▪ Wet – Oil Pressure – Vacuum • Sounds – Bottom end – Top end – Valve train – Clutch basket
3. Utilize diagnostic measuring instruments	• Leak down monitor • Fuel pressure gauge • Oil pressure gauge • Compression gauge • Vacuum gauge • Manometer

4. Describe engine tear-down and inspection

- Inspection
  - Rotational wear
  - Reciprocating wear
  - Warpage
  - Fractures
  - Runout
    - Radial
    - Linear
  - Heat discolouring

Achievement Criteria:
Given a written and/or a practical assessment on engine condition the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K9 Service cylinder heads on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Service cylinder heads on four-stroke engines.
- Discuss cylinder head styles.
- Service four-stroke cylinder heads.

LEARNING TASKS	CONTENT
1. Service cylinder head styles	• Head styles – "L" Shape – OHV – OHC – DOHC
2. Discuss cylinder head service	• Inspection – Warpage – Heat effects – Cooling fin condition – Cooling jacket condition – Combustion area condition – Valve guide condition – Valve seat condition – Sparkplug thread condition – Cracks
3. Service four-stroke cylinder heads	• Warpage • Heat effects • Cooling fin condition • Cooling jacket condition • Combustion area condition • Valve guide condition • Valve seat condition • Sparkplug thread condition • Cracks • Head planing

Achievement Criteria:
Given a written and/or a practical assessment on cylinder heads on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K10 Service valve train on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe designs for valve clearance adjustment.
- Perform valve clearance adjustments.
- Describe OHC drive types and tensioners.
- Service OHC drive tensioners.

LEARNING TASKS	CONTENT
1. Describe designs for valve clearance adjustment	• Rocker arm/cam follower tappet screw • Eccentric rocker shaft • Adjustable push rod • Shim/cam follower • Shim over and under bucket • Hydraulic tappet
2. Perform valve clearance adjustments	• Rocker arm/cam follower tappet screw • Eccentric rocker shaft • Adjustable push rod • Shim/cam follower • Shim over and under bucket • Hydraulic tappet
3. Describe OHC drive types and tensioners	• Drives – Chain – Belt – Gear • Tensioners – Automatic – Semi-automatic – Manual • Tension adjustment procedures
4. Service OHC drive tensioners	• Chain, belt and gear drives • Tensioners – Automatic – Semi-automatic – Manual

Achievement Criteria:
Given a written and/or a practical assessment on valve train on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K11 Service cylinders and pistons on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe piston design and construction.
- Service cylinders.
- Service pistons.

LEARNING TASKS	CONTENT
1. Describe piston design and construction	• Shape and heat expansion – Cam ground – Skirt length • Valve cutaways • Pin offset • Ring technology – Straight rail – Keystone – Dykes – Oil control – Markings – Installation
2. Service cylinders	• Squish plates • Torque plates • Inspecting • Boring • Alignment • Top & bottom sealing • Honing • Deglazing
3. Service pistons	• Measuring lands • Inspecting • Cleaning • De-carbonizing • Installation precautions • Ring gaps

Achievement Criteria:
Given a written and/or a practical assessment on cylinders and pistons on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment
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LINE (GAC): K ENGINES

Competency: K12 Service crankshaft assembly on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe crankshaft design and function.
- Discuss crankshaft components.
- Service crankshaft.

LEARNING TASKS	CONTENT
1. Describe crankshaft design and function	• Design – Journals – Roller bearing – Plain bearing – Forged – Steel – Pressed – Lamination (multi piece) – Single throws – Multi throws – Offset throws (splayed)
2. Discuss crankshaft components	• Components – Connecting rods – Flywheels – Thrust washers – Harmonic balancers – Bearings
3. Service crankshaft	• Inspect straightness – Truing • Measure journals • Polish journals • Inspect keyways • Inspect oil ways

Achievement Criteria:
Given a written and/or a practical assessment on crankshaft assembly on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K13 Service counter balancer assemblies on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe design, Operation and function of engine counterbalancer.
- Service engine counterbalancer inspection, servicing, installation and timing.

LEARNING TASKS	CONTENT
1. Describe design, operation and function of engine counterbalancer	• Design – Journals – Counter weights ▪ Single ▪ Multi – Housings – Drive systems ▪ Chain ▪ Gear
2. Service engine counterbalancer inspection, servicing, installation and timing	• Inspect straightness • Measure journals • Measure bearings • Measure oil clearance • Timing • Assess bearing condition

Achievement Criteria:
Given a written and/or a practical assessment on counter balancer assemblies on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K14 Service engine cases on four-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe engine case design and function.
- Service engine cases.

LEARNING TASKS	CONTENT

1. Describe engine case design and function	• Design
	  – Vertical split
	  – Horizontal split
	  – Cylinder integration
	• Components
	  – Bearing bosses
	  – Access ports and covers
	• Operation

2. Service engine cases	• Remove and replace components • Diagnose failure • Inspect check valves and galleries • Inspect straightness of mating surfaces • Inspect for stress cracks • Line bore

Achievement Criteria:
Given a written and/or a practical assessment on engine cases on four-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K15 Assess engine condition

Objectives

To be competent in this area, the individual must be able to:

- Assess engine condition.
- Describe engine tear-down and inspection.

LEARNING TASKS	CONTENT
1. Assess engine condition	• Assessments – Compression ▪ Primary ▪ Secondary – Base pressure – Vacuum • Sounds – Bottom end – Top end – Valve train
2. Describe engine tear-down and inspection	• Component removal & replacement • Inspection – Rotational wear – Reciprocating wear – Warpage – Fractures – Runout ▪ Radial ▪ Linear – Heat discolouring – Metal transfer

Achievement Criteria:
Given a written and/or a practical assessment on engine condition the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K16 Service cylinder heads on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe two-stroke cylinder head styles.
- Describe two-stroke cylinder head components.
- Service two-stroke cylinder heads.

LEARNING TASKS	CONTENT
1. Describe two-stroke cylinder head styles	• Head styles – Air cooled – Liquid cooled
2. Describe two-stroke cylinder head components	• Components – Decompressor – Spark plug – Sensors
3. Service two-stroke cylinder heads	• Inspection – Warpage – Carbon build-up – Heat effects – Cooling fin condition – Cooling jacket condition – Combustion area condition – Gasket failure – Cracks • Service – De-carbon – Clear cooling fins – Check cooling passages – Gasket Re&Re – Inspect sparkplug hole

Achievement Criteria:
Given a written and/or a practical assessment on cylinder heads on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K17 Service valve train on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe valve system types.
- Describe valve components.
- Service valve train.

LEARNING TASKS	CONTENT
1. Describe valve system types	• Types of valve systems – Reed – Rotary – Piston port
2. Describe valve components	• Components – Reeds – Rotary valves – Power valve actuators
3. Service valve train	• Diagnose failure • Remove and replace components • Decarbonization

Achievement Criteria:
Given a written and/or a practical assessment on valve train on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K18 Service cylinders and pistons on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe piston design and construction.
- Describe piston ring design, construction and operation.
- Describe engine cylinder design and construction.
- Service cylinders.

LEARNING TASKS	CONTENT

1. Describe piston design and construction	• Shape and heat expansion
	  – Cam ground
	  – Skirt length
	• Valve cutaways
	• Pin offset
	• Ports
	  – Intake
	  – Exhaust
	  – Impulse
	• Cast
	• Forged

2. Describe piston ring design, construction and operation	• Straight rail • Keystone • Dykes • Locator pins • Markings • Installation
3. Describe engine cylinder design and construction	• Cast iron • Aluminum • Plated cylinder bores • Internal porting • Sleeve cylinders

4. Service cylinders

- Diagnose failure
  - Ring
  - Cylinder wall
  - Mechanical
- Servicing
  - Cleaning
  - Measuring
  - Ring replacement
  - Land cleaning
  - Boring
  - Alignment
  - Top & bottom sealing
  - Honing
  - Chamfering
  - Deglazing

Achievement Criteria:
Given a written and/or a practical assessment on cylinders and pistons on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K19 Service crankshaft assembly on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe crankshaft design and function.
- Discuss crankshaft components.
- Service crankshafts.

LEARNING TASKS	CONTENT
1. Describe crankshaft design and function	• Design – Journals – Single throws – Multi throws – Built-up (laminated) – Single support – Multi support
2. Discuss crankshaft components	• Components – Connecting rods – Labyrinth(mechanical seals) – Seals – Flywheels – Thrust washers – Bearings ▪ Big end ▪ Small end – Crank stuffers – Crank bearings
3. Service crankshafts	• Disassembly/assembly • Measure journals • Polish journals • Inspect straightness

Achievement Criteria:
Given a written and/or a practical assessment on crankshaft assembly on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K20 Service counter balancer assemblies on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe design, operation, and function of engine counterbalance.
- Describe engine counter balancer inspection, servicing, installation and timing.
- Perform service on a counter balancer.

LEARNING TASKS	CONTENT
1. Describe design, operation, and function of engine counterbalancer	• Design – Journals – Counter weights ▪ Single ▪ Multi – Housings – Drive systems ▪ Gear
2. Describe engine counterbalancer inspection, servicing, installation and timing	• Inspect straightness • Measure journals • Measure bearings and oil clearance • Timing
3. Perform counter balancer service	• Inspect straightness • Measure journals • Measure bearings and oil clearance • Timing • Installation

Achievement Criteria:
Given a written and/or a practical assessment on counter balancer assemblies on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): K ENGINES

Competency: K21 Service engine cases on two-stroke engines

Objectives

To be competent in this area, the individual must be able to:

- Describe engine case design and function.
- Service engine cases.

LEARNING TASKS	CONTENT
1. Describe engine case design and function	• Design – Cylinder integration – Vertical split – Horizontal split • Components – Bearing bosses – Access ports and covers • Operation
2. Service engine cases	• Remove and replace components • Diagnose failure • Inspect check valves and galleries • Inspect straightness of mating surfaces • Inspect for stress cracks • Inspect bearing bosses

Achievement Criteria:
Given a written and/or a practical assessment on engine cases on two-stroke engines the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): L GASKET AND SEAL CONSTRUCTION AND SERVICE

Competency: L1 Describe soft gasket construction and use

Objectives

To be competent in this area, the individual must be able to:

- Describe soft gasket construction.
- Describe gasket use.
- Describe cause of failure diagnosis.

LEARNING TASKS	CONTENT
1. Describe soft gasket construction	• Gaskets – Rubber – Paper – Cork – Reusable – Felt – Neoprene – Coatings – O-rings ▪ Chemical application ▪ Tapered ▪ Heat sensitive ▪ Preformed
2. Describe gasket use	• Uses – Water ways – Low pressure oil sealing – Air passages – Gas sealing
3. Describe cause of failure diagnosis	• Incorrect assembly • Excessive heat • Over pressurization • Lack of lubrication • Seal deterioration • Mating surface damage

Achievement Criteria:
Given a written and/or a practical assessment on soft gasket construction and use the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): L GASKET AND SEAL CONSTRUCTION AND SERVICE

Competency: L2 Describe hard gasket construction and use

Objectives

To be competent in this area, the individual must be able to:

- Describe hard gasket construction.
- Describe gasket use.
- Describe cause of failure diagnosis.

LEARNING TASKS	CONTENT

1. Describe hard gasket construction	• Gaskets
	  – Copper
	  – Stainless steel
	  – Steel and graphite
	  – Aluminum
	• Composite
	• Plastic

2. Describe gasket use	• Cylinder head • Cylinder base • Exhaust manifold • Intake manifold • Crankcase
3. Describe cause of failure diagnosis	• Incorrect assembly • Excessive heat • Over pressurization • Lack of lubrication • Seal deterioration • Mating surface damage

Achievement Criteria:
Given a written and/or a practical assessment on hard gasket construction and use the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): L GASKET AND SEAL CONSTRUCTION AND SERVICE

Competency: L3 Describe seal construction and use

Objectives

To be competent in this area, the individual must be able to:

- Describe seal construction.
- Describe seal use.
- Describe cause of failure diagnosis.

LEARNING TASKS	CONTENT
1. Describe seal construction	• Seals – Two-piece split – One-piece radial – Fiber packing – Speedy sleeve • Construction material – Viton (400°F) – Nitrile (280°F) – Labyrinth (mechanical sleeve)
2. Describe seal use	• Rotating shaft • Reciprocating shaft
3. Describe cause of failure diagnosis	• Incorrect assembly • Excessive heat • Over pressurization • Lack of lubrication • Seal deterioration • Mating surface damage

Achievement Criteria:
Given a written and/or a practical assessment on seal construction and use the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): L GASKET AND SEAL CONSTRUCTION AND SERVICE

Competency: L4 Describe sealant composition and application

Objectives

To be competent in this area, the individual must be able to:

- Describe sealant composition.
- Describe sealant application.

LEARNING TASKS	CONTENT
1. Describe sealant composition	• RTV • Silicone • Flexible

2. Describe sealant application	• Anaerobic
	• Aerobic
	  – Mating surfaces
	  – Thread sealing
	  – Thread locking

Achievement Criteria:
Given a written and/or a practical assessment on sealant composition and application the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): M PRECISION MEASURING INSTRUMENTS

Competency: M1 Utilize precision measuring instruments on select components

Objectives

To be competent in this area, the individual must be able to:

- Utilize precision measuring instruments.
- Conduct various measurements.

LEARNING TASKS	CONTENT
1. Utilize precision measuring instruments	• Micrometer • Vernier • Torque wrench • Dial indicator • Feeler gauge • Plasti-gauge • V-blocks
2. Conduct various measurements	• Calibrate and use precision measuring tools on selected components • Measurements – Inside – Outside – Depth – Radial – Linear – Circumference – Diameter – Stroke – Torque – Run-out – Taper

Achievement Criteria:
Given a written and/or a practical assessment on precision measuring instruments on select components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): N EXHAUST SYSTEMS

Competency: N1 Describe exhaust system design and maintenance

Objectives

To be competent in this area, the individual must be able to:

- Describe exhaust system design and maintenance.
- Describe four-cycle exhaust system design.
- Describe two-cycle exhaust system design.

LEARNING TASKS	CONTENT
1. Describe silencing techniques	• Muffler construction – Expansion chambers – Packing – Wadding • Aftermarket silencers
2. Describe four-cycle exhaust system design	• Wave travel and acoustic tuning • Headers • Catalytic convertors • Spark arresters
3. Describe two-cycle exhaust system design	• Wave travel and expansion chamber design • Spark arresters • Variable valve

Achievement Criteria:
Given a written and/or a practical assessment on exhaust system design and maintenance the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): N EXHAUST SYSTEMS

Competency: N2 Service two and four-stroke exhaust systems

Objectives

To be competent in this area, the individual must be able to:

- Service two and four stroke exhaust systems.

LEARNING TASKS	CONTENT
1. Service exhaust systems	• Component Re&Re • System cleaning • Exhaust gaskets • Maintenance – Repacking – Decarbonizing

Achievement Criteria:
Given a written and/or a practical assessment on two and four-stroke exhaust systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O1 Describe starting systems

Objectives

To be competent in this area, the individual must be able to:

- Describe starting systems.

LEARNING TASKS

1. Describe starting systems

CONTENT

- Design
  - Pull
  - Electrical
    - Gear reduction
    - Direct
  - Kick

Achievement Criteria:
Given a written and/or a practical assessment on starting systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O2 Service manual starting systems

Objectives

To be competent in this area, the individual must be able to:

- Discuss manual starting systems.
- Service manual starters.

LEARNING TASKS	CONTENT
1. Discuss manual starting systems	• Systems – Pull ▪ Recoil ▪ Wrapped rope – Kick – Ezee start
2. Service manual starters	• Remove and replace components – Recoil spring ▪ Kick ▪ Pull – Pedals – "T" handles – Sprag clutch/one way

Achievement Criteria:
Given a written and/or a practical assessment on manual starting systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O3 Describe diagnosing starting systems

Objectives

To be competent in this area, the individual must be able to:

- Describe electric starting systems.
- Diagnose electric starting systems.

LEARNING TASKS	CONTENT
1. Describe electric starting systems	• Design – Electric solenoid – Mechanical solenoid – Drive systems ▪ Gear reduction ▪ Direct – Gear ratio – Field windings – Brushes – Secondary wiring – Primary wiring – Armature – Commutator
2. Diagnose electric starting systems	• Diagnosis – Battery tests – Starter draw – Voltage drop – Field continuity – Commutator to armature – Brush condition – Drive faults

Achievement Criteria:
Given a written and/or a practical assessment on diagnosing starting systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O4 Service selected starters

Objectives

To be competent in this area, the individual must be able to:

- Service selected starters.

LEARNING TASKS

1. Service selected starters

CONTENT

- Troubleshooting
  - Electrical draw tests
  - Voltage drop tests
- Service
  - Clean & inspect contacts
  - Test solenoid performance
  - Starter Re&Re
  - Bench tests
  - Inspect starter drive function
  - Perform disassembly
  - Component identification
  - Continuity tests

Achievement Criteria:
Given a written and/or a practical assessment on selected starters the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O5 Describe charging systems

Objectives

To be competent in this area, the individual must be able to:

- Describe charging systems.
- Describe charging system components.

LEARNING TASKS	CONTENT
1. Describe charging systems	• Types – Generators – Magnetic induction coil – Alternators – Portable generators
2. Describe charging system components	• Generator – Armature – Commutator – Brushes – Drive end frames • Alternator/portable generators – Rotor – Field winding – Stator – Rectifier – Drive end frame – Brushes – Slip rings • Regulator – Field control ▪ "A" Circuit ▪ "B" Circuit

Achievement Criteria:
Given a written and/or a practical assessment on charging systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O6 Diagnose charging systems

Objectives

To be competent in this area, the individual must be able to:

- Diagnose charging systems.

LEARNING TASKS

1. Diagnose charging systems

CONTENT

- Tests
  - Full field
  - Voltage output
  - Continuity
  - Diodes
  - Shorts
  - High resistance
  - Opens
  - Polarization

Achievement Criteria:
Given a written and/or a practical assessment on charging systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): O STARTING AND CHARGING SYSTEMS

Competency: O7 Service selected charging systems

Objectives

To be competent in this area, the individual must be able to:

- Service selected charging systems.

LEARNING TASKS

1. Service selected charging systems

CONTENT

- Test output voltage
- Removal and replace
- Disassembly and reassembly
- Diode tests
- Inspect and test
  - Stator
  - Field windings
  - Armature
  - Rotor
  - Bushings
  - Bearings
  - Brushes
  - Commutator
  - Regulators
  - Lighting coils
  - Low oil lights
  - Receptacles

Achievement Criteria:
Given a written and/or a practical assessment on selected charging systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Level 3

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F6 Describe wheel servicing

Objectives

To be competent in this area, the individual must be able to:

- Describe wheel servicing.
- Perform wheel service.

LEARNING TASKS	CONTENT
1. Describe wheel service	• Inspection – Runout – Bends – Warps – Bearing damage – Bead – Torque specifications – Sealing • Handling precautions – Styles – Taping – Scratches – Chips – Sharp objects
2. Perform wheel service	• Inspection • Bead cleaning and preparation • Bearing removal, replacement and service • Torqueing procedures

Achievement Criteria:
Given a written and/or a practical assessment on wheel servicing the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F7 Service spoked wheels

Objectives

To be competent in this area, the individual must be able to:

- Discuss spoke wheel terms.
- Service spoked wheels.

LEARNING TASKS	CONTENT
1. Describe spoked wheel terms	• Terms – Tuning – De lacing – Lacing
2. Service spoked wheels	• Tune • De lace • Lace

Achievement Criteria:
Given a written and/or a practical assessment on spoked wheels the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F8 Service solid wheels

Objectives

To be competent in this area, the individual must be able to:

- Describe solid wheel styles.
- Service solid wheels.

LEARNING TASKS	CONTENT
1. Describe solid wheel styles	• Styles – Drop center – Steel – Drop forged aluminum – Cast – Plastic – Carbon fibre – Billet – Stamped • Sublet wheel repairs
2. Service solid wheels	• Inspection • Minor straightening

Achievement Criteria:
Given a written and/or a practical assessment on solid wheels the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): F WHEELS, TIRES AND SUSPENSION

Competency: F9 Service two-piece wheels

Objectives

To be competent in this area, the individual must be able to:

- Describe two-piece wheels.
- Service two-piece wheels.

LEARNING TASKS	CONTENT
1. Describe two-piece wheels	• Construction – Split rim – Split hub – Tubes – Liners
2. Service two-piece wheels	• Service – Tube installation & precautions – Rim dismantling & precautions – Rim assembly – Inflation precautions

Achievement Criteria:
Given a written and/or a practical assessment on two-piece wheels the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I8 Describe principles of electricity

Objectives

To be competent in this area, the individual must be able to:

- Describe principles of electricity.

LEARNING TASKS	CONTENT
1. Describe principles of electricity	• Principles – Electron flow – Left hand rule (coils) – Positive switching – Negative switching

Achievement Criteria:
Given a written and/or a practical assessment on principles of electricity the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I9 Identify common electrical and electronic components

Objectives

To be competent in this area, the individual must be able to:

- Identify common electrical and electronic components.

LEARNING TASKS	CONTENT
1. Identify common electrical and electronic components	• Electrical – Terminals – Switches – Fuses – Fuse links – Circuit breakers – Power source ▪ Battery ▪ Capacitors ▪ Power cords – Connectors – Bulbs – Diodes – Resistors (single, variable, stepped) • Electronic – Load components ▪ Relays ▪ Capacitors, condensers, suppressers ▪ Coils ▪ Solenoids ▪ LEDs ▪ Transistors (NPN, PNP) ▪ Pulse generators – Zener diodes – Printed circuits

Achievement Criteria:
Given a written and/or a practical assessment on common electrical and electronic components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I10 Describe ignition system types and operations

Objectives

To be competent in this area, the individual must be able to:

- Describe ignition system circuits.
- Describe the operation of different ignition system types.
- Describe ignition advance techniques.

LEARNING TASKS	CONTENT
1. Describe ignition system circuits	• Primary and secondary circuits • High tension coil operation • Timing mechanisms
2. Describe the operation of different ignition system types	• Battery – Point – Transistorized – CDI (Capacitor Discharged Ignition) • Flywheel magneto – Point – CDI – Transistorized
3. Describe ignition advance techniques	• Centrifugal • Vacuum • Basic electronic • Digitally controlled

Achievement Criteria:
Given a written and/or a practical assessment on ignition system types and operations the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I11 Service electronic distributor ignition systems

Objectives

To be competent in this area, the individual must be able to:

- Discuss ignition systems.
- Service ignition systems.

LEARNING TASKS	CONTENT
1. Discuss electronic distributor ignition systems	• Battery ignition components – Points – Condenser – Rotor – Resisters – Coil (primary, secondary) – Pick-up – Spark plugs ▪ Reach ▪ Heat range ▪ Type • Magneto ignition components – Points – Condenser – Resisters – Coil (primary, secondary) – Pick-up – Spark plugs ▪ Reach ▪ Heat range ▪ Type
2. Service electronic distributor ignition systems	• Tune up • Dynamic testing – Use of oscilloscope-interpret patterns – Primary circuit – Secondary circuit – Timing light – Dwell meter – Tachometer – Exhaust gas analyzer • Static testing and repair – Coil – Condenser – Resisters

  - Primary and secondary wiring
  - Distributor assembly
  - Points
  - Advance mechanism
  - Distributor cam wear
  - Magneto air gap
  - Distributor shaft, bushings and drive gear
  - Distributor cap
  - Rotor
  - Spark plugs
- Manufacturer's specifications

Achievement Criteria:
Given a written and/or a practical assessment on electronic distributor ignition systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I12 Service electronic ignition systems

Objectives

To be competent in this area, the individual must be able to:

- Describe electronic ignition systems.
- Service electronic ignition systems.

LEARNING TASKS	CONTENT
1. Describe electronic ignition systems	• Types – Magneto/transistor CDI – Battery/transistor – Battery CDI (Capacitor Discharged Ignition)
2. Service electronic ignition systems	• Tune up • Dynamic testing – Use of oscilloscope-interpret patterns – Primary circuit – Secondary circuit – Timing light/set timing – Dwell meter – Tachometer – Exhaust gas analyzer • Static testing and repair – Coil – Primary and secondary wiring – Exciter coil – Trigger devise ▪ Hall effect – Modules – Advance mechanism – Spark plugs • Manufacturer's specifications

Achievement Criteria:
Given a written and/or a practical assessment on electronic ignition systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P1 Describe various frame and suspension styles

Objectives

To be competent in this area, the individual must be able to:

- Describe frame designs.
- Describe frame design variables and how they affect handling.
- Describe various suspension systems.

LEARNING TASKS	CONTENT
1. Describe frame designs	• Full cradle • Double cradle • Engine-based • Perimeter (Delta) • Backbone • Diamond • Single cradle • Stamped • Modular
2. Describe frame design variables and how they affect handling	• Wheelbase • Trail and offset • Rake • Centre of gravity
3. Describe various suspension systems	• Telescopic • Bottom link – Trailing – Leading – Knee action • Adjustable – Air – Cam • Single spring • Multi spring

Achievement Criteria:
Given a written and/or a practical assessment on various frame and suspension styles the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P2 Describe servicing select frames

Objectives

To be competent in this area, the individual must be able to:

- Describe inspecting selected frames.
- Describe servicing selected frames.

LEARNING TASKS	CONTENT
1. Describe inspecting selected frames	• Inspections – Alignment ▪ Tire scrub/wear ▪ Steering out of position – Frames ▪ Cracking ▪ Strain ▪ Bolt alignment ▪ Modifications ▪ Safety ▪ Warpage
2. Describe servicing selected frames	• Straightening • Re-enforcing • Adjusting • Precautions • Manufacturer's recommendations • Module Re&Re

Achievement Criteria:
Given a written and/or a practical assessment on servicing selected frames the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P3 Inspect and service select steering heads and dampers

Objectives

To be competent in this area, the individual must be able to:

- Describe steering component parts and operation.
- Inspect select steering heads and dampers.
- Service select steering heads and dampers.

LEARNING TASKS	CONTENT
1. Describe steering component parts and operation	• Steering head • Triple clamps • Bearings • Steering dampers • Worm and gear • Rack and pinion • Power steering – Types – System components ▪ Pumps ▪ Relief valves ▪ Flow valves • Front axle components • Linkages • Component wear factors
2. Inspect selected steering heads and dampers	• Inspection – Bearings – Mounts – Head play – Bushings – Ram leaks – Bracket condition – Correct head tightening
3. Service selected steering heads and dampers	• Service – Bearing adjustment – Lubing – Bracket repair/replacement – Bushing removal/replacement – Steering head bearing and race removal and replacement

Achievement Criteria:
Given a written and/or a practical assessment on select steering heads and dampers the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P4 Inspect and service front suspension components

Objectives

To be competent in this area, the individual must be able to:

- Describe telescopic front-fork operation.
- Describe front suspension design variations.
- Inspect front suspension components.
- Service front suspension components.

LEARNING TASKS	CONTENT
1. Describe telescopic front fork operation	• Component parts and construction • Damper mechanism operation • Cartridge forks
2. Describe front suspension design variations	• Air assist • Inverted forks • Anti-dive • Leading and trailing link • Swing arm/hub centre steering • Spring types • Shock absorbers • Stabilizers
3. Inspect front suspension components	• Inspection – Leaks – Low pressure – Dive – Bent forks – Rust pitting
4. Service front suspension components	• Safety precautions • Inspection and diagnose • Lubrication • Remove and replace suspension components • Use of specialized tools • Adjust suspension components • Fork oil change • Fork disassembly and assembly • Seal replacement • Fork tube straightening • Filling bladders • Bleeding air

Achievement Criteria:

Given a written and/or a practical assessment on front suspension components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P5 Inspect and service rear suspension components

Objectives

To be competent in this area, the individual must be able to:

- Describe rear suspension components.
- Inspect rear suspension components.
- Service rear suspension components.

LEARNING TASKS	CONTENT
1. Describe rear suspension components	• Spring technology – Spring rate – Progressive springs – Preload • Shock absorber technology – Emulsion – Nitrogen gas • Trailing linkage bearings • Bushings
2. Inspect rear suspension components	• Inspection – Bushings ▪ Cracks ▪ Splits ▪ Weathering ▪ Separations ▪ Wear – Springs ▪ Sag ▪ Breaks ▪ Mounts ▪ Wear – Shocks ▪ Leaks ▪ Bends ▪ Mounts ▪ Dents ▪ Wear
3. Service rear suspension components	• Linkage service • Damper unit rebuilding • Nitrogen charging/recharging

Achievement Criteria:
Given a written and/or a practical assessment on rear suspension components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): P CHASSIS AND SUSPENSION

Competency: P6 Inspect and service swing arms

Objectives

To be competent in this area, the individual must be able to:

- Describe swing arms.
- Inspect swing arms.
- Service swing arms.

LEARNING TASKS	CONTENT
1. Describe swing arms	• Designs – Single pivot – Dual pivot – Single sided – Dual sided
2. Inspect swing arms	• Inspections – Pivots ▪ Bushings ▪ Bushing housings ▪ Needle bearings ▪ Pins • Bends • Rust • Twists • Dust boots
3. Service swing arms	• Pivots – Bushing removal/replacement – Needle bearing removal/replacement – Dust boot removal/installation – Swing arm removal/replacement – Pin removal/replacement

Achievement Criteria:
Given a written and/or a practical assessment on swing arms the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): Q MANUAL TRANSMISSIONS

Competency: Q1 Describe clutch systems

Objectives

To be competent in this area, the individual must be able to:

- Describe clutch systems.

LEARNING TASKS

1. Describe clutch systems

CONTENT

- Clutch components
  - Clutch disc
    - Lining material
    - Cushion springs
    - Torsional springs
  - Pressure plate
    - Diaphragm spring
    - Coil spring
    - Semi-centrifugal type
  - Pilot bearing
  - Release bearing mechanisms
- Types
  - Belt tensioning clutches (CVT)
  - Jaw clutches
  - Electromagnetic clutches (Safety Brake)
    - Types
    - Purpose
    - Applications
    - Adjustments
  - Wet/dry
  - Centrifugal
  - Friction cup and cone
- Single clutch
- Multiple clutch design
- Clutch release mechanisms
  - Cable
  - Linkage
  - Hydraulic
  - Centrifugal
  - Brake

Achievement Criteria:
Given a written and/or a practical assessment on clutch systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): Q MANUAL TRANSMISSIONS

Competency: Q2 Service clutches on selected systems

Objectives

To be competent in this area, the individual must be able to:

- Describe clutch service.
- Service clutches on selected systems.

LEARNING TASKS	CONTENT

1. Describe clutch service	• Diagnose/failure analysis
	• Fluid selections
	• Adjustment
	  – Mechanical
	  – Hydraulic
	• Slippage
	• Dragging
	• Grabbing
	• Chatter
	• Disassembly and assembly techniques
	• Safety switches

2. Perform clutch service	• Disassembly • Inspection • Measurement • Alignment • Reassembly • Adjustment of clutches on selected units • Manufacturer's recommendations

Achievement Criteria:
Given a written and/or a practical assessment on clutch service the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): Q MANUAL TRANSMISSIONS

Competency: Q3 Describe transmission design and operation

Objectives

To be competent in this area, the individual must be able to:

- Describe transmission design and operation.
- Describe gear ratios.
- Calculate gear ratios.

LEARNING TASKS	CONTENT
1. Describe transmission design and operation	• Types – Constant mesh sliding gear – Friction disc drives – Friction cup and cone drives – Torque multiplied through gears • Component parts – Gear types ▪ Spur ▪ Helical ▪ Bevel – Synchronizer – Shift forks • Power flow • Design variations – 3 speed – 4 speed – 5 speed – Overdrive – Variable pulley
2. Describe gear ratios	• Torque multiplying ratios • Overdrive ratios
3. Calculate gear ratios	• Transmission – Torque multiplying – Overdrive – Dual range • Final drive – High ratio – Low ratio – Dual range

Achievement Criteria:
Given a written and/or a practical assessment on transmission design and operation the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): Q MANUAL TRANSMISSIONS

Competency: Q4 Describe shifter mechanisms and kick starter design and operation

Objectives

To be competent in this area, the individual must be able to:

- Describe shifter mechanisms design and operation.
- Describe kick starter design and operation.

LEARNING TASKS	CONTENT
1. Describe shifter mechanisms design and operation	• Shifter drum • Shift forks • Cam plates and detents • Change mechanisms and design variations
2. Describe kick starter design and operation	• Basic design types – Kick start ▪ Ratchet and pawl ▪ Cam-engaged radial ratchet ▪ Thread spindle • Components – One-way clutches – Return springs

Achievement Criteria:
Given a written and/or a practical assessment on shifter mechanisms design and operation the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): Q MANUAL TRANSMISSIONS

Competency: Q5 Disassemble, inspect and assess manual transmission parts

Objectives

To be competent in this area, the individual must be able to:

- Disassemble manual transmission parts.
- Inspect and assess manual transmission parts.
- Reassemble manual transmission.

LEARNING TASKS	CONTENT
1. Disassemble manual transmission	• Disassembly – Procedure – Layout – Separation from engine – Heating sources and precautions – Cleaning
2. Inspect and assess manual transmission parts	• Inspection – Housing damage – Shift fork wear/condition – Wear patterns – Bearings – Synchromesh – Shaft distortion – Filing collection – Binding – Seizing – Roughness – Noise • Failure assessment – Cause of failure
3. Reassemble manual transmission	• Pre lube • Bearing pre load • Sealant/gaskets • Shift fork alignment • Torque values • Verify operations • Fluid levels

Achievement Criteria:
Given a written and/or a practical assessment on manual transmission parts the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): R PRIMARY DRIVE SYSTEMS

Competency: R1 Describe various primary drive systems

Objectives

To be competent in this area, the individual must be able to:

- Describe various primary drive systems.

LEARNING TASKS

1. Describe various primary drive systems

CONTENT

- Roller and Hyvo chain,
- Belt, and tensioners
- Gears
  - Straight-cut
  - Straight-cut offset
  - Helical gear
- Cushion drives
- Couplers

  Drive shafts

Achievement Criteria:
Given a written and/or a practical assessment on various primary drive systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): R PRIMARY DRIVE SYSTEMS

Competency: R2 Service primary drive chains and sprockets

Objectives

To be competent in this area, the individual must be able to:

- Describe inspection of primary drive chains and sprockets.
- Service primary drive chains and sprockets.

LEARNING TASKS	CONTENT
1. Describe inspection of primary drive chains and sprockets	• Inspection – Drive to drive backlash – Sprocket wear – Chain wear and noise – Guide wear – Cover wear – Coupler wear
2. Service primary drive chains and sprockets	• Component maintenance • Component adjustment • Component replacement

Achievement Criteria:
Given a written and/or a practical assessment on primary drive chains and sprockets the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): R PRIMARY DRIVE SYSTEMS

Competency: R3 Service primary drive belts and pulleys

Objectives

To be competent in this area, the individual must be able to:

- Describe primary drive belts.
- Service primary drive belts.

LEARNING TASKS	CONTENT
1. Describe primary drive belts	• Types – "V" – Multiple "V" – Cogged • Composition – Rubber – Cloth sheath – Rating
2. Service primary drive belts	• Inspection – Tension – Friction – Arc of contact – Speed – Power output – Alignment • Service – Adjustments – Remove and replace – Routing • Troubleshooting – Failure analysis – Flipping – Slippage – Squealing – Cracking – Repeat fracture – Heat – Puncture – Belt degradation

Achievement Criteria:
Given a written and/or a practical assessment on primary drive belts and pulleys the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): R PRIMARY DRIVE SYSTEMS

Competency: R4 Service primary drive shafts

Objectives

To be competent in this area, the individual must be able to:

- Describe primary drive shafts.
- Service primary drive shafts.

LEARNING TASKS	CONTENT
1. Describe primary drive shafts	• Flexible – Couplers • Solid – U-joints – CV-joints – Slip joint • Power flow • Middle gear case • Final drive gear case • Lubrication • Inspection • Alignment • Failure analysis
2. Service primary drive shafts	• Removal/replace components • Lubrication • Flexible – Couplers • Solid – U-joints – CV-joints – Slip joints ▪ Key cut ▪ Square cut ▪ Rectangular cut

Achievement Criteria:
Given a written and/or a practical assessment on primary drive shafts the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): R PRIMARY DRIVE SYSTEMS

Competency: R5 Service power take-offs

Objectives

To be competent in this area, the individual must be able to:

- Describe power take-offs.
- Service power take-offs.

LEARNING TASKS	CONTENT
1. Describe power take-off	• Mounting – Attached – Remote • Engagement – Mechanical – Electrical • Safety Brake • Overload release mechanisms – Slip clutch – Shear pins
2. Service power take-offs	• Service – Engagement adjustment ▪ Mechanical ▪ Electrical – Driveline run-out and balance ▪ With brake ▪ Without brake – Mounting – Oil – Output shaft – Safety brake • Repair procedures – Replace U-joints – Center support bearings – Drive-shaft balancing – CV-joints – Safety brake ▪ Draw test ▪ Adjustments/clearance ▪ Engagement/ disengagement – Bushing replacement

Achievement Criteria:
Given a written and/or a practical assessment on power take-offs the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S1 Describe final drive systems and variations

Objectives

To be competent in this area, the individual must be able to:

- Describe final drive systems and variations.

LEARNING TASKS

1. Describe final drive systems and variations

CONTENT

- Chain drives
  - Cushioned
  - Uncushioned
- Belt drives
  - Cushioned
- Shaft drives
- Differentials
- 4X4 Systems
- Hydrostatic

Achievement Criteria:
Given a written and/or a practical assessment on final drive systems and variations the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S2 Describe final drive chains and sprockets

Objectives

To be competent in this area, the individual must be able to:

- Describe final drive chains and sprockets.

LEARNING TASKS

1. Describe final drive chains and sprockets

CONTENT

- Advantages
- Types of chains
  - Roller
  - Roller less
  - Silent
  - Detachable link
  - Pintle
  - Block
  - O-ring
  - Non O-ring
- Drive arrangements
- Matching chains and sprockets
- Lubrication
- Wear
- Sprockets
  - Cushioned
  - Non cushioned

Achievement Criteria:
Given a written and/or a practical assessment on final drive chains and sprockets the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S3 Service final drive chains and sprockets

Objectives

To be competent in this area, the individual must be able to:

- Service final drive chains and sprockets.

LEARNING TASKS

1. Service final drive chains and sprockets

CONTENT

- Aligning sprockets and shafts
- Installing and detaching
- Checking slack
  - Idler pulley
- Adjusting
  - Manufacturer's specification
- Lubricating
  - Manufacturer's specification
- Checking chain and sprocket wear
- Chainsaw
  - Sharpening
  - Guide bar
    - Lengths
    - Adjustments
    - Oiling
    - Cleaning
    - Inspection

Achievement Criteria:
Given a written and/or a practical assessment on final drive chains and sprockets the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S4 Describe final drive shafts and gears

Objectives

To be competent in this area, the individual must be able to:

- Describe final drive shafts and gears.

LEARNING TASKS

1. Describe final drive shafts and gears

CONTENT

- Flexible
  - Angle
  - Whip
  - Couplers
- Solid
  - U-joint
  - Splined
  - Slip joint
  - Constant velocity
  - Keyway
- Gears
  - Spiral bevel
  - Hypoid
  - Helical cut spur
  - Gear tooth nomenclature
- Axles
  - Taper fit
  - Integral carrier
  - Three-piece split housing
  - Semi floating
  - Full floating
  - Single reduction
  - Double reduction
  - Planetary
  - Worm Gear
- Transaxle types

Achievement Criteria:
Given a written and/or a practical assessment on final drive shafts and gears the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S5 Service final drive shafts and gears

Objectives

To be competent in this area, the individual must be able to:

- Service final drive shafts and gears.

LEARNING TASKS

1. Service final drive shafts and gears

CONTENT

- Shafts
  - Lubrication
  - Wear inspection
  - Removal and replacement
- Gears
  - Lubrication
  - Removal and inspection
  - Measurement and assessment
  - Shimming
- Bearings and seals
- Overhaul
  - Disassemble procedure
  - Component inspection and evaluation
  - Assembly procedure
  - Pinion depth setting
  - Pinion bearing preload
  - Side bearing preload
  - Ring gear and case run-out check
  - Ring gear and pinion backlash
  - Interpret gear tooth pattern characteristics
  - Diagnose drive axle and differential noise
  - Interpret gear wear

Achievement Criteria:
Given a written and/or a practical assessment on final drive shafts and gears the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S6 Describe final drive belts, sprockets and pulleys

Objectives

To be competent in this area, the individual must be able to:

- Describe final drive belts, sprockets and pulleys.

LEARNING TASKS	CONTENT
1. Describe final drive belts, sprockets and pulleys	• Types – "V" ▪ Wrapped ▪ Raw • Multiple – Cogged – Tracks • Precautions – Oils and greases – Tight bends – Proper adjustment • Drives and pulleys

Achievement Criteria:
Given a written and/or a practical assessment on final drive belts, sprockets and pulleys the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): S FINAL DRIVE SYSTEMS

Competency: S7 Service final drive belts, sprockets and pulleys

Objectives

To be competent in this area, the individual must be able to:

- Service final drive belts, sprockets and pulleys.

LEARNING TASKS	CONTENT
1. Service final drive belts, sprockets and pulleys	• Removal and replacement • Inspection – Cracks – Holes – Stretch – Splits – Wear – Alignment – Tension – Noise • Matching – Length/width – Cog size – Application – Power – Taper – Turn radius

Achievement Criteria:
Given a written and/or a practical assessment on final drive belts, sprockets and pulleys the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): T HYDRAULIC SYSTEMS

Competency: T1 Describe hydraulic systems and components

Objectives

To be competent in this area, the individual must be able to:

- Describe basic hydraulic systems and components.
- Describe operating principles.

LEARNING TASKS	CONTENT
1. Describe basic hydraulic systems and components	• Fluids – Viscosity and viscosity index – SAE and API service ratings – Service ratings – Types ▪ Synthetics ▪ Petroleum ▪ Bio-degradable (environmental) • Components – Reservoir – Filter/10 micron – Pump – Motor – Control valves ▪ Pressure ▪ Volume – Control valve activators ▪ Manual ▪ Air ▪ Hydraulic – Accumulators – Actuators ▪ Cylinder ▪ Motors – Coolers ▪ Air to oil ▪ Water to oil – Lines & fittings
2. Describe operating principles	• Closed-centre systems • Open-centre systems • Open-centre with parallel connection • Closed-centre with a variable displacement pump • Power flow through each system

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic systems and components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): T HYDRAULIC SYSTEMS

Competency: T2 Service hydraulic pumps

Objectives

To be competent in this area, the individual must be able to:

- Describe the design, construction and operation of hydraulic pumps.
- Service hydraulic pumps.

LEARNING TASKS	CONTENT
1. Describe the design, construction and operation of hydraulic pumps	• Fixed displacement • Variable displacement • Gear • Vane • Piston • Cavitation • Aeration
2. Perform service procedures on pumps	• Pressure and flow tests – Cycle times • Safety in testing – Procedures – Component removal – Disassembly • Component inspection and assessment procedures – Measurement procedures • Repair • Replacement • Reassembly • Installation procedures

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic pumps the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): T HYDRAULIC SYSTEMS

Competency: T3 Service hydraulic valves

Objectives

To be competent in this area, the individual must be able to:

- Describe the design, construction and operation of hydraulic valves.
- Service hydraulic valves.

LEARNING TASKS	CONTENT
1. Describe the design, construction and operation of hydraulic valves	• Directional control valves – Direct-acting – Pilot-operated – Check • Pressure control – Main relief – Circuit relief – Lock – Sequence – Unloading – Counterbalance – Pressure reducing • Flow control valves – Flow dividers
2. Perform service procedures on hydraulic valves	• Pressure and flow testing • Component removal • Disassembly • Inspection • Assessment • Cleaning • Reassembly • Replacement and reinstallation procedures

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic valves the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): T HYDRAULIC SYSTEMS

Competency: T4 Service hydraulic actuators

Objectives

To be competent in this area, the individual must be able to:

- Describe the design, construction and operation of hydraulic actuators.
- Describe hydraulic actuator seals and sealing arrangement.
- Perform service procedures for hydraulic actuators.
- Describe design and operation of hydraulic motors.
- Perform service procedures for motors.

LEARNING TASKS	CONTENT
1. Describe the design, construction and operation of hydraulic actuators	• Cylinders – Single acting – Double acting – Double rod • Motors fixed displacement – Gear – Vane – Piston • Principles of hydrostatic devices • Piston pump/piston motor-component wear and failure factors – Dirt – Cavitation – Aeration
2. Describe hydraulic actuator seals and sealing arrangement	• Chevron packing • O-rings • Teflon seals • Lip seals • Mechanical and quad-ring seals • Packing backing (Teflon)

3. Perform service procedures on Hydraulic actuators	• Troubleshooting procedures for leaks – Packings – Leaking outside seals – Isolation procedures • Cylinder removal – Disassembly – Inspection and assessment – Replacement – Seal replacement – Reassembly – Pre lube – Reinstallation procedures
4. Describe design and operation of hydraulic motors	• Fixed displacement • Variable displacement – Gear – Vane – Piston types – Variations of these • Applications
5. Perform service procedures on motors	• Pressure and flow tests • Safety in testing and repair procedures • Component removal • Disassembly • Inspection and assessment • Repair • Replacement • Reassembly and installation procedure

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic actuators the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): T HYDRAULIC SYSTEMS

Competency: T5 Utilize hydraulic schematic diagrams

Objectives

To be competent in this area, the individual must be able to:

- Describe hydraulic schematic diagrams.
- Utilize hydraulic schematic diagrams.

LEARNING TASKS	CONTENT
1. Describe hydraulic schematic diagrams	• Sources – Manufacturers – Service manuals – Internet sources • System components • Fluid flow • Troubleshooting
2. Utilize hydraulic schematic diagrams	• Sources – Manufacturers – Service manuals – Internet sources • Identify system components • Identify fluid flow • Troubleshooting

Achievement Criteria:
Given a written and/or a practical assessment on hydraulic schematic diagrams the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Level 4

MOTORCYCLE & POWER EQUIPMENT TECHNICIAN

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I13 Describe computer control systems

Objectives

To be competent in this area, the individual must be able to:

- Describe computer control systems.

LEARNING TASKS

1. Describe computer control systems

CONTENT

- Interface circuits
  - Input
  - Output
- ECM/ABS
  - Location
  - Identification
  - Precautions
  - Memory
- Inputs/sensors
  - Intake air temperature
  - Intake pressure
  - Throttle sensor
  - Intake flow meters
  - O_2 sensor
  - Crankshaft sensor
  - Camshaft sensor
  - Coolant temperature sensor
  - Fall detection sensor
  - Barometric sensor
- Outputs/actuators
  - Coils
  - Injectors
  - Idle control
  - Fuel pump
  - Cold start systems
  - Malfunction indicator lamp
- Secondary intake

Achievement Criteria:
Given a written and/or a practical assessment on computer control systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I14 Interpret wiring diagrams

Objectives

To be competent in this area, the individual must be able to:

- Discuss electronic diagram systems.
- Interpret wiring diagrams.

LEARNING TASKS	CONTENT
1. Discuss electronic diagram systems	• Systems – Powertrain – ABS
2. Interpret wiring diagrams	• Interpret symbols – Fuel injectors – Speed sensors – Pressure sensors – Relays – ECM – Fall detection switches – Test couplers – Safety switches – Low-oil switches

Achievement Criteria:
Given a written and/or a practical assessment on wiring diagrams the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I15 Describe diagnostic procedures

Objectives

To be competent in this area, the individual must be able to:

- Describe diagnostic procedures.
- Describe the diagnostic process.

LEARNING TASKS	CONTENT
1. Describe diagnostic procedures	• Lab scope signals – Wave form (analog) – Square form (digital) • Sensor testing – Reference voltage – Volt generating sensors – Variable resistance sensors – Heated sensors
2. Describe the diagnostic process	• Confirm concern • Identify relates info • Service bulletin • Confirm fault • Repair as required – Confirm repair

Achievement Criteria:
Given a written and/or a practical assessment on diagnostic procedures the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I16 Utilize electrical test equipment

Objectives

To be competent in this area, the individual must be able to:

- Utilize electrical test equipment.

LEARNING TASKS

1. Utilize electrical test equipment

CONTENT

- Equipment
  - Scanners
  - Lab scopes
  - Interface systems
  - Manometer
  - Exhaust analyzers
  - Dynometer
  - Engine analyzers
  - Graphing multimeter

Achievement Criteria:
Given a written and/or a practical assessment on electrical test equipment the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I17 Service computer control systems

Objectives

To be competent in this area, the individual must be able to:

- Service computer control systems.

LEARNING TASKS	CONTENT
1. Service computer control systems	• Locating diagnostic connectors • Self diagnostic modes • Reset memories • Health checks • Data streaming

Achievement Criteria:
Given a written and/or a practical assessment on computer control systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I18 Describe engine management systems

Objectives

To be competent in this area, the individual must be able to:

- Describe engine management systems.

LEARNING TASKS	CONTENT
1. Describe engine management systems	• Factors effecting system – Barometric pressure – Ambient temperature – Intake air mass • Feedback – Open loop – Closed loop • Adaptive memory • Code setting • Fuel cut • Stoichiometric • Inputs • Outputs

Achievement Criteria:
Given a written and/or a practical assessment on engine management systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I19 Test engine management input sensors

Objectives

To be competent in this area, the individual must be able to:

- Test engine management input sensors.

LEARNING TASKS

1. Test engine management input sensors

CONTENT

- Systems
  - O_2
  - Air measuring
  - Running temperature
  - EFE
  - Fuel trim
- Data streaming (live data)
- Recording data movies
- DTC interpreting
  - "P" codes
  - Alphanumerical codes
- Over rev protection input
- Inputs/sensors
  - Intake air temperature
  - Intake pressure
  - Throttle sensor
  - Intake flow meters
  - O_2 sensor
  - Crankshaft sensor
  - Camshaft sensor
  - Coolant temperature sensor
  - Fall detection sensor
  - Barometric sensor

Achievement Criteria:
Given a written and/or a practical assessment on engine management input sensors the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I20 Test engine management output actuators

Objectives

To be competent in this area, the individual must be able to:

- Test engine management output actuators.

LEARNING TASKS

1. Test engine management output actuators

CONTENT

- Actuators
  - Coils
  - Injectors
  - Idle control
  - Fuel pump
  - Cold start systems
  - Malfunction indicator lamp
  - Throttle steppers
  - Digital malfunction indictors

Achievement Criteria:
Given a written and/or a practical assessment on engine management output actuators the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I21 Analyze on board diagnostic data

Objectives

To be competent in this area, the individual must be able to:

- Describe trouble code retrieval.
- Analyze on-board diagnostic data.

LEARNING TASKS	CONTENT
1. Describe trouble code retrieval	• Types of data – Flash codes – No codes – Codes – Open loop – Closed loop – Methods of retrieval – Scan tools
2. Analyze on-board diagnostic data	• Data streaming – Flash codes – Codes/no codes – ECM ▪ O_2 signals ▪ TPS adjusting ▪ Idle adjusting ▪ "P" codes ▪ Alphanumerical codes ▪ Numerical codes – Security – Tip monitor – Radio – ABS – Air bags – Traction control (can-am spider)

Achievement Criteria:
Given a written and/or a practical assessment on on-board diagnostic data the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): I ELECTRICAL AND ELECTRONICS

Competency: I22 Describe new vehicle technology

Objectives

To be competent in this area, the individual must be able to:

- Describe new vehicle technology.

LEARNING TASKS

1. Describe new vehicle technology

CONTENT

- 3-wheeled bikes
  - Electronic steering
  - Alignment
- Hybrid
- Hydrostatic power-load shift sensing
- Traction control
- Cylinder management
- Electronic steering
- Braking systems
- Drive by wire
- Fly by wire
- Electronic throttle

Achievement Criteria:
Given a written and/or a practical assessment on new vehicle technology the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U1 Describe fuel types

Objectives

To be competent in this area, the individual must be able to:

- Describe fuel types.

LEARNING TASKS

1. Describe fuel types

CONTENT

- Fuel types
  - Gasoline
  - Diesel
  - Liquified petroleum gas (LPG)
  - Compressed natural gas (CNG)
  - Flex fuels
- Fuel ratings
  - Octane
  - Cetane
  - BTU's

Achievement Criteria:
Given a written and/or a practical assessment on fuel types the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U2 Service carbureted fuel delivery components

Objectives

To be competent in this area, the individual must be able to:

- Discuss two and four-stroke fuel system components.
- Discuss symptoms.
- Service two and four-stroke fuel delivery components.

LEARNING TASKS	CONTENT
1. Discuss two and four-stroke fuel system components	• Components – Fuel tank – Fuel lines – Pet cocks (valve) ▪ Electrical ▪ Mechanical ▪ Vacuum – Fuel pumps ▪ Internal ▪ External – Carburetor – Fuel cap ▪ Vented ▪ Non-vented – Shut off – Fuel filters
2. Discuss symptoms	• Symptoms – Rough idle – Stalling – Flooding – Hesitation – High speed miss – Lack of power

3. Service two and four-stroke fuel delivery components

- Services
  - Pressure testing (two-stroke)
  - Inspection
  - Removal
  - Assessment
  - Adjustments
  - Replacement
  - Re kitting
  - Overhaul
  - Safety procedures
  - Diagnosing circuit problems

Achievement Criteria:
Given a written and/or a practical assessment on carbureted fuel delivery components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U3 Describe carburetors

Objectives

To be competent in this area, the individual must be able to:

- Describe laws of science related to carburetors.
- Describe the construction and operating principles of carburetors.
- Describe carburetor design variations.

LEARNING TASKS	CONTENT
1. Describe laws of science related to carburetors	• Carburation • Atomization • Vaporization • Volatility • Pre ignition • Venturi principle • Detonation • Air fuel ratios “stoichiometric”
2. Describe the construction and operating principles of carburetors	• Carburetor circuits – Float – Enrichment (cold start) – Low speed/idle circuit (mixture) – High speed – Acceleration – Power
3. Describe carburetor design variations	• Carburetor design – Updraft – Sidedraft – Downdraft – Single and double barrel – CFM flow – Float – Suction lift – Pulsating lift – Diaphragm – Variable venturi

Achievement Criteria:
Given a written and/or a practical assessment on carburetors the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U4 Describe gasoline fuel injection types and controls

Objectives

To be competent in this area, the individual must be able to:

- Describe gasoline fuel injection types and controls.

LEARNING TASKS	CONTENT
1. Describe gasoline fuel injection types and controls	• Injection types – Sequential – Multi port – Direct – Single port • Controls – ECM – Sensors

Achievement Criteria:
Given a written and/or a practical assessment on gasoline fuel injection types and controls the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U5 Service gasoline fuel injection components

Objectives

To be competent in this area, the individual must be able to:

- Service gasoline fuel injection components.

LEARNING TASKS

1. Service gasoline fuel injection components

CONTENT

- Components
  - Filters/strainers
  - Injectors
  - Lines
  - Pressure regulator
  - Idle control
  - Throttle body
  - Air bypass
  - Evaporative emission control (EVAP)
- Service
  - Fuel pressure tests

Achievement Criteria:
Given a written and/or a practical assessment on gasoline fuel injection components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U6 Describe diesel delivery systems

Objectives

To be competent in this area, the individual must be able to:

- Describe diesel delivery systems.

LEARNING TASKS

1. Discuss diesel delivery systems

CONTENT

- Start-up and shut down procedures
  - Starting aids
  - Emergency shut-down
  - Danger of run-away
- Compression test
- Component removal
- Testing and replacement
  - Fuel injectors
  - Fuel lines
  - Injection pump
  - Fuel filters
  - Glow plugs
  - Turbo-chargers
- Injection pump timing
- Fuel delivery or supply pump testing

Achievement Criteria:
Given a written and/or a practical assessment on diesel delivery systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U7 Service diesel delivery systems

Objectives

To be competent in this area, the individual must be able to:

- Describe installation and timing procedures for diesel fuel system components.
- Describe types and application of governors.
- Describe governor construction differences.
- Describe troubleshooting procedures.
- Service diesel delivery and metering systems.

LEARNING TASKS	CONTENT
1. Describe installation and timing procedures for diesel fuel system components	• Fuel injection pumps • Injector lines • Matching of injectors • Gasket cleaning procedures for injection components • Installation sequence – Injector pump shut off rack alignment • Torque specifications
2. Describe types and application of governors	• Limiting speed • Variable speed • Constant speed • Pneumatic and hydraulic
3. Describe governor construction differences	• Mechanical • Servo-mechanical • Hydraulic and pneumatic governors
4. Describe troubleshooting procedures	• Lack of power • Hard starting – Uneven running – Frequent stalling • Sudden stopping • Variations on exhaust smoke • Abnormal oil consumption • Excessive vibration or noise

5. Service diesel delivery and metering systems

- Service
  - Inlet exhaust cleaning
  - Injector cleaning
  - Glow plug testing
  - Injector pump timing
  - Turbo service
  - Balance test
  - PCV cleaning
  - Fuel supply pressure test
  - Filters
    - Water trap
    - Fuel

Achievement Criteria:
Given a written and/or a practical assessment on diesel delivery systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U8 Describe alternate fuels

Objectives

To be competent in this area, the individual must be able to:

- Describe alternate fuels.
- Describe alternate fuel precautions.

LEARNING TASKS	CONTENT
1. Describe alternate fuels	• Fuels – LPG – CNG – Bio fuels – Methanol – M-85 – Ethanol (Flex fuel) – E-85 – Electric fuels ▪ Battery ▪ Solar – Hydrogen
2. Describe alternate fuel precautions	• Precautions – Gaseous – Liquid – Electric

Achievement Criteria:
Given a written and/or a practical assessment on alternate fuels the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U9 Perform fuel system tuning with an exhaust analyzer

Objectives

To be competent in this area, the individual must be able to:

- Perform fuel system tuning with an exhaust analyzer.

LEARNING TASKS	CONTENT
1. Perform fuel system tuning with an exhaust analyzer	• Test preparation • Calibration • Interpret CO, HC, O_2 and CO_2 readings • Opacity testing • NO_x analyzing • Idle and cruise tests • Riv-nut installation • EGA maintenance • Exhaust gas analyzer (EGA) • Pilot screw adjustment • Performance problem troubleshooting

Achievement Criteria:
Given a written and/or a practical assessment on fuel system tuning with an exhaust analyzer the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): U FUEL SYSTEMS

Competency: U10 Describe power enhancement equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe power enhancement equipment.

LEARNING TASKS	CONTENT
1. Describe power enhancement equipment	• Power enhancement equipment – Super chargers – Turbo chargers – Nitrous oxide – Ram air – Supplementary fuel enhancement (aftermarket) – Secondary fuel management box's – Exhaust systems

Achievement Criteria:
Given a written and/or a practical assessment on power enhancement equipment the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V1 Describe centrifugal force clutches

Objectives

To be competent in this area, the individual must be able to:

- Describe centrifugal force clutches.

LEARNING TASKS

1. Describe centrifugal force clutches

CONTENT

- Part breakdown
  - Clutch basket
  - Hub/shoes
  - Drive pinion
  - Pressure plate
  - Centrifugal rollers
  - Springs
  - Primary and secondary drive plates
  - Driven plates
  - Drive belt

Achievement Criteria:
Given a written and/or a practical assessment on centrifugal force clutches the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V2 Service selected centrifugal force clutches

Objectives

To be competent in this area, the individual must be able to:

- Service selected centrifugal force clutches.

LEARNING TASKS

1. Service selected centrifugal force clutches

CONTENT

- Service
  - Inspection
    - Clutch driven plates
    - Clutch drive plates (shoes)
    - Clutch springs
    - Anti-rattle springs
    - Sprag (centrifugal rollers)
    - Gear teeth
  - Replacement
    - Clutch driven plates
    - Clutch drive plates
    - Clutch springs
    - Anti-rattle springs
    - Sprag (centrifugal rollers)
    - Gear teeth
- Belt replacement
- Chain replacement

Achievement Criteria:
Given a written and/or a practical assessment on selected centrifugal force clutches the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V3 Describe automatic transmission function

Objectives

To be competent in this area, the individual must be able to:

- Describe automatic transmission function.

LEARNING TASKS

1. Describe automatic transmission function

CONTENT

- Styles
  - Semi automatic (centrifugal clutch & gear)
  - CVT (centrifugal clutch and belt drive)
  - Hydraulic drive
- Functions
  - No- shift
  - Shift
  - Range select

Achievement Criteria:
Given a written and/or a practical assessment on automatic transmission function the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V4 Service automatic transmission clutches and components

Objectives

To be competent in this area, the individual must be able to:

- Service automatic transmissions clutches and components.

LEARNING TASKS	CONTENT
1. Service automatic transmissions clutches and components	• Automatic clutches – Centrifugal – Variable belt • Components – Pulleys – Weights – Clutch outer case – Planetary gear sets – Axles ▪ Main ▪ Counter • Adjustments – Shift start – Shift finish

Achievement Criteria:
Given a written and/or a practical assessment on automatic transmissions clutches and components the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V5 Describe hydrostatic drive and power steering systems

Objectives

To be competent in this area, the individual must be able to:

- Describe, design and operation hydrostatic drive systems.
- Describe the construction and operation of power steering.

LEARNING TASKS	CONTENT
1. Describe design and operation of hydrostatic drives	• Piston pump • Piston motor • Charge pump • Component wear factors/failure – Dirt – Cavitation – Aeration • Application • Parts brake down – End cap – Relief valves – Valve plate – Block – Piston assembly – Swash plate – Input shafts – Bearings – Springs – Spacers/washers – Housing – Seals
2. Describe design construction and operation of power steering	• Types (pumps) • System components – Relief valve/flow control valve – Steering gear – Steering box • Component wear factors/failures – Dirt – Cavitation – Aeration • Application • Installation of safety bars – Roll over protection (ROP)

Achievement Criteria:
Given a written and/or a practical assessment on hydrostatic drive and power steering systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

LINE (GAC): V AUTOMATIC DRIVE SYSTEMS

Competency: V6 Service hydrostatic drive and power steering systems

Objectives

To be competent in this area, the individual must be able to:

- Service hydrostatic drive systems.
- Service power steering systems.

LEARNING TASKS	CONTENT
1. Perform service procedures on hydrostatic drives	• Pressure and flow tests • Regular service checks • Component repair • Replacement • Reassembly and reinstallation procedures • Safety procedures
2. Service power steering systems	• Component bleed down • Cleaning • Removal • Disassembly • Inspection and assessment, replacement and/or reassembly • Installation • Testing and adjusting procedures

Achievement Criteria:
Given a written and/or a practical assessment on hydrostatic drive and power steering systems the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- The minimum requirements are a well heated and ventilated classroom 900 square feet (e.g. 30' x 30') with tables and chairs suitable for adults
- The classroom should be equipped with a large whiteboard (4' x 8'), a flip chart, a white matte screen (6 or 7 ft.), an overhead projector, and a TV/VCR

Note: A multi-media projector with a lap-top computer is advisable but optional

Shop Area

The working area should be a minimum of:

- 3000 square feet for 12 students (50% outdoors fenced area)
- 4000 square feet for 14 students (50% outdoors fenced area)
- 5000 square feet for 16 students (50% outdoors fenced area)

- Shop area should have at least 22 foot ceiling space to allow for scaffold erecting. The working area must be equipped with suitable hand tools and power tools.

Note: Training must simulate job-site conditions as much as possible

Lab Requirements

- N/A

Student Facilities

- N/A

Instructor's Office Space

- N/A

Other

- N/A

Tools and Equipment

Shop Equipment

Required

- Allen wrenches
- Bearing driver
- Brass mallet
- Bushing and seal driver
- Combination wrench set
- Cylinder hone
- Drill
- Heel and hammer
- Lock wrench
- Pin/hook wrench
- Plug socket
- Punch
- Riveting tool
- Screwdriver
- Slide hammer
- Socket
- Spoke wrench
- Threaded insert
- Torque plates
- Valve seat cutter
- Wire brush
- Wire cutting tool
- Wire wheel brush
- Ball hone
- Bearing puller
- Bushing and seal driver
- Circlip pliers
- Crimping tool
- Dead-blow hammer
- File
- Hone
- Mallet lever
- Pliers
- Probe
- Reamers
- Rubber mallet
- Seal driver
- Snap ring pliers
- Spanner wrench
- Tensioner socket
- Tire iron
- Torque wrench
- Valve seat cutter
- Wire connector
- Wire stripping tool
- Vacuum pump

Recommended

- N/A

Shop (Facility) Tools

Standard Tools

- Alignment bars
- Bearing installation tool
- Bleeding equipment
- Brake lathe
- Carbon scraper
- Computer diagnostic equipment
- Crank installer
- Crankshaft puller
- Damper rod holder
- Electrical termination tool
- Frame jig
- Gasket scraper
- Guide installation pilot
- Headlight aiming equipment
- Line lap
- Battery charger
- Bench grinder
- Brake cylinder hone
- Cable lubber
- Chain breaker
- Crank aligning jig
- Crankcase separator
- Cylinder hone
- Dynometer
- Electronic diagnostic equipment
- Gasket remover
- Grinder
- Hand pump
- Honing stone
- Magnetic base

- Metal lathe
- Paint checker
- Piston pin puller
- Rotary drive shaft puller
- Seal installer
- Tire balancing equipment
- Tire mounting equipment
- Valve resurfacing tool
- Vice
- Wheel balancing equipment
- Wheel truing jig
- Nitrogen recharging unit
- Parallel bars
- Ring compressor
- Seal driver
- Seal remover
- Tire machine
- Truing jack
- V-block
- Water bath
- Wheel jig

Specialty Tools

Cutting/Heating Tools and Equipment

- Electric arc welding equipment
- Oxyacetylene welding
- Propane torch
- Heat gun
- Cutting equipment
- Soldering equipment

Pneumatic and Electric Power Tools

- Bonding equipment
- Glass bead blaster
- Hydraulic jack
- Impact driver
- Riveting equipment
- Spring shock compressor
- Compressed air gun
- Grinder
- Hydraulic press
- Impact tool
- Rotary tool
- Valve spring compressor

Measuring Devices

- Air pressure gauge
- Ball gauge
- Caliper
- Coolant tester
- Degree wheel
- Engine tachometer
- Graduated cylinder
- Hydrometer
- Inside micrometer
- Micrometer
- Oil pressure gauge
- Pounds pull gauge
- Steel rule
- Straightedge gauge
- Telescopic gauge
- Tire pressure gauge
- Vacuum gauge
- Alignment tool
- Boring bar
- Carburetor float level gauge
- Cylinder bore gauge
- Dial indicator
- Feeler gauge
- Height gauge
- Inclinometer
- Inside/outside calipers
- Multimeter
- Plasti-gage
- Protractor (magnetic)
- Straightedge
- Tape measure
- Torque wrench in/lb, ft/lb nm
- Tread depth gauge
- Vernier caliper

Diagnostic and Testing Tools

- Alignment tool
- Coil tester
- Crankcase pressure test equipment
- Leak-down tester
- Multimeter
- Stethoscope
- Timing light
- Borescope
- Compression tester
- Hydrometer/refractometer
- Load tester
- Pressure tester
- Test light
- Vacuum gauge

Student Equipment (supplied by school)

Required

- N/A

Recommended

- N/A

Student Tools (supplied by student)

Required

- N/A

Recommended

- N/A

Reference Materials

Required Reference Materials

- Motorcycles; Johns & Edmunston, ISBN 978-1-56637-479-8
- Trade Common Core Line J, BC Govt . ISBN 978-0-7719-1475-1
- AST Custom package, Alberta Govt. Trades Learning Guides 7850000433

Recommended Resources

- N/A

Suggested Texts

- Outdoor Power Equipment, Webster, combined with Motorcycle Technology, Aldo (ISBN pending)

Instructor Requirements

Occupation Qualification

The instructor must possess:

- The instructor must have completed an apprenticeship in either occupation and have the Certificate of Qualification for Power Equipment and/or Red Seal endorsement for Motorcycle Mechanic.
- The instructor must write and pass the Challenge package for the new Motorcycle & Power Equipment program.

Work Experience

- A minimum of 5 years experience working in the industry as a journeyperson.
- Must have diverse Motorcycle & Power Equipment industry experience including that which would cover all the competencies in this level.
- Must have recent Motorcycle & Power Equipment trade experience.

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructors Certificate (minimum 30 hour course)
- Instructors must have or be registered in an Instructor's Diploma Program, to be completed within a five year period or hold a Bachelors or Masters Degree in Education.

Appendices

Appendix A

Assessment Guidelines

Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING: SkilledTradesBC PORTAL CODE:	Motorcycle & Power Equipment Technician LEVEL 1 0166MR12		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
A	Safe Work Practices	10%	6%
B	Business Procedures	11%	4%
C	Hand and Shop Tools	21%	19%
D	Lubrication and Cooling Systems	10%	11%
E	Bearing Design, Construction and Service	3%	6%
F	Wheels, Tires and Suspension	10%	14%
G	Chain Belt and Shaft Drive Systems	7%	0%
H	Brake Systems	11%	15%
I	Electrical and Electronics	14%	20%
J	New Unit Assembly and Service	3%	5%
	Total	**100%**	**100%**
In-school theory / practical subject competency weighting		80%	20%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score Combined theory and practical subject competency multiplied by		80%	
Standard Level Exam Percentage Score The exam score is multiplied by		20%	
Final Percentage Score		FINAL%	

PROGRAM: IN-SCHOOL TRAINING: SkilledTradesBC PORTAL CODE:	Motorcycle & Power Equipment Technician LEVEL 2 0166MR12		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
D	Lubrication and Cooling Systems	7%	14%
K	Engines	45%	50%
L	Gasket and Seal Construction and Service	9%	4%
M	Precision Measuring Instruments	0%	7%
N	Exhaust Systems	9%	4%
O	Starting and Charging Systems	30%	21%
	Total	**100%**	**100%**
In-school theory / practical subject competency weighting		80%	20%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score **Combined theory and practical subject competency multiplied by**		80%	
Standard Level Exam Percentage Score **The exam score is multiplied by**		20%	
Final Percentage Score		FINAL%	

PROGRAM: IN-SCHOOL TRAINING: SkilledTradesBC PORTAL CODE:	Motorcycle & Power Equipment Technician LEVEL 3 0166MR12		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
F	Wheels, Tires and Suspensions	7%	9%
I	Electrical and Electronics	17%	21%
P	Chassis and Suspension	18%	15%
Q	Manual Transmissions	23%	18%
R	Primary Drive Systems	9%	11%
S	Final Drive Systems	12%	9%
T	Hydraulic Systems	14%	17%
	Total	**100%**	**100%**
In-school theory / practical subject competency weighting		80%	20%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score **Combined theory and practical subject competency multiplied by**		80%	
Standard Level Exam Percentage Score **The exam score is multiplied by**		20%	
Final Percentage Score		FINAL%	

PROGRAM: IN-SCHOOL TRAINING: SkilledTradesBC PORTAL CODE:	Motorcycle & Power Equipment Technician LEVEL 4 / OR FINAL LEVEL 0166MR12		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
I	Electrical and Electronics	34%	34%
U	Fuel Systems	43%	46%
V	Manual Transmissions	23%	20%
	Total	**100%**	**100%**
In-school theory / practical subject competency weighting		80%	20%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score **Combined theory and practical subject competency multiplied by**		80%	
Standard Level Exam Percentage Score **The exam score is multiplied by**		20%	
Final in-school percentage score Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal or SkilledTradesBC CofQ exam.		IN-SCHOOL %	

All apprentices who complete Level 4 of the Motorcycle Mechanic (Motorcycle & Power Equipment Technician) program with a FINAL level percentage score of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

SkilledTradesBC will enter the apprentices' Motorcycle Mechanic (Motorcycle & Power Equipment Technician) Interprovincial Red Seal examination percentage score in SkilledTradesBC Portal.

A minimum percentage score of 70% on the examination is required for a pass.