Agricultural Equipment Technician Course Outline

2021



Saskatchewan Apprenticeship and Trade Certification Commission

1-877-363-0536 apprenticeship@gov.sk.ca saskapprenticeship.ca

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) apprenticeship technical training at the topic level.

Level One	Transcript Code	Hours
Air Conditioning and Haating	AIR 100 - Theory	15
Air Conditioning and Heating	AIR 101 - Shop	15
Electrical	ELEC 122 - Theory	30
Electrical	ELEC 123 - Shop	30
Discol Fuel Oveterno	ENGN 117 - Theory	15
Diesel Fuel Systems	ENGN 118 - Shop	15
Pasia Hydrauliae	HYDR 105 - Theory	30
Basic Hydraulics	HYDR 106 - Shop	30
Souding and Tillago Equipment	MACH 173 - Theory	15
Seeding and Tillage Equipment	MACH 174 - Shop	15
Powertrains 1	TRNM 105 - Theory	15
	TRNM 106 - Shop	15
		240

Level Two	Transcript Code	Hours
Electrical Systems	ELEC 274 - Theory	30
Electrical Systems	ELEC 275 - Shop	30
Engine Operation and System Components	ENGN 274 - Theory	30
Engine Operation and System Components	ENGN 275 - Shop	30
Harvesting, Hay and Forage	MACH 270 - Theory	30
	MACH 271- Shop	30
Sprayora and Applicatora	MACH 272- Theory	15
Sprayers and Applicators	MACH 273- Shop	15
Powertrains 2	TRNM 270 - Theory	15
	TRNM 271 - Shop	15
		240

Level Three	Transcript Code	Hours
Electrical/Electronic Intro	ELEC 388 - Theory	15
	ELEC 389 - Shop	15
Diagol Fuel Systems Diagnostics	ENGN 388 - Theory	15
Diesel Fuel Systems Diagnostics	ENGN 389 - Shop	15
Hudroulio Sustama	HYDR 388 - Theory	20
Hydraulic Systems	HYDR 389 - Shop	40
Powertrains Advanced	TRNM 388 - Theory	25
Fowertrains Auvanceu	TRNM 389 - Shop	35
	WELD 372 - Theory	30
OFC/SMAW Welding	WELD 373 - Shop	30
		240



Level Four	Transcript Code	Hours
Electrical/Electronic Diagnosia	ELEC 490 - Theory	35
Electrical/Electronic Diagnosis	ELEC 491 - Shop	25
Advanced Engines and Overhaul	ENGN 486 - Theory	25
Advanced Engines and Overhaul	ENGN 487 - Shop	35
Hydraulia System Diagnostica	HYDR 486 - Theory	15
Hydraulic System Diagnostics	HYDR 487 - Shop	45
Machinany Diagnosia	MACH 486 - Theory	20
Machinery Diagnosis	MACH 487 - Shop	10
Equipment Performance	TRNM 486- Theory	20
	TRNM 487 - Shop	10
		240



TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing. For the harmonized level of training, a cross reference to the National Occupational Analysis (NOA) apprenticeship technical training sequencing, at the learning outcome level, is provided.

Leve	el One	8 weeks	240 hours
• • •	nditioning and Heating- discuss refrigerants and lub identify types of heater sys identify types of air condition Identify types of HVAC sys Describe pneumatics system Identifoning and Heating	bricants tem malfunctions oning system malfunctions tems ems	15 hours 15 hours
•	troubleshoot heater system troubleshoot air conditionin evaluate pneumatics suspe	n malfunctions ng system malfunctions	
Electr • • •	discuss the construction ar parallel circuits describe the operation and identify basic electrical syst	etween electricity and magnetism ad properties of series, parallel and series- function of circuit control devices	15 hours
Electr • • •	ical – Shop perform boosting procedure troubleshoot basic electrica repair wiring harness and c use basic electrical system discuss wet cell batteries service wet cell batteries	al circuit problems connectors	15 hours
Diese • • •	discuss the procedure to m discuss the repair of low an explain diesel engine comb discuss the repair of diesel discuss internal and extern	nd high-pressure fuel system components oustion chamber designs fuel injectors	15 hours
•	Fuel Systems– Shop perform compression and I evaluate an air induction sy	eak down tests on a diesel engine /stem	15 hours Saskatchewan

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- service fuel systems
- repair low and high-pressure fuel system components
- inspect diesel engine combustion chamber designs
- service diesel fuel injectors
- inspect internal and external threads

 Basic Hydraulics- Theory read basic hydraulic systems symbols identify hoses and fittings explain the operation of hydraulic pumps explain the operation of pressure control valves explain the operation of flow control valves explain the operation of directional control valves explain the operation of basic hydraulic brakes explain the operation of hydraulic actuators 	30 hours
 Basic Hydraulics – Shop inspect hydraulic brake components service hydraulic systems repair cylinders and motors install hydraulic system components perform basic troubleshooting procedures on a hydraulic system 	30 hours
 Seeding and Tillage Equipment - Theory describe anhydrous ammonia safety and the operation of anhydrous applicators describe the principles and theory of operation for seed carts, seeding tools, and tillage equipment describe equipment adjustments for various seeding rates and field conditions describe basic hydraulic and electrical principles as they apply to seeding and tillage equipment explain basic global positioning system functions 	15 hours
 Seeding and Tillage Equipment – Shop perform pre-delivery and service requirements for various types of seed carts, seeding tools, and tillage equipment by using manufacturer's procedures. apply operating principles of various components on seed carts, seeding tools, and tillage equipment apply the operating principles of hydraulic and electrical components for seeding and tillage equipment inspect global positioning system components for variable rate metering 	15 hours
 Powertrains 1 –Theory explain lifting and hoisting procedures describe the construction and operation of clutch linkages and transmission brakes describe clutch system components describe safety precautions when separating tractors describe steering axles and their functions 	15 hours

• describe theory of gears, gear ratios and bearing construction

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Powertrains 1 – Shop

- perform lifting and hoisting procedures
- perform procedures to support, block, and lift equipment
- split tractor to repair or replace components
- adjust clutch linkages and transmission brakes
- perform inspection of clutch system components
- align clutch components and flywheel

Level One topics that are taught in context:

- safety
- planning and communication
- operational testing
- scheduled maintenance

For details regarding the In Context Topic, see page 25



Leve	el Two	8 weeks	240 hours
• • •	describe the operation describe the operation describe the evolution equipment ical Systems – Sh test capacitors, dioc repair charging system repair starting system	on of capacitors, diodes, and transistors on of the charging system components on of the starting system components on of network systems on modern agricultur op les and transistors em and components m components lect a CAN BUS implement to a CAN BUS	30 hours
Engin • • • • • • •	explain the principle describe the operation explain the difference identify methods to discuss the inspection discuss splash and discuss the inspection	on of a two-stroke cycle and four-stroke cyc e between air-cooled and liquid-cooled eng repair damaged threads on of cooling system components easuring tools pressurized lubrication systems on of cylinder heads tion of internal engine components	0
Engin • • • • • •	e Operation and S examine the compo examine air-cooled	ystem Components – Shop nents of a four-stroke cycle engine and liquid-cooled engines I external threading procedures em components es and pullers ds uring tools	30 hours
Harve • • •	describe hydrostatic describe the theory describe the theory describe yield monit and sensors	iction of belts, chains and power take off (P	pring
Harve • • •		and PTO shafts	30 hours
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- perform adjustments on harvesting equipment for various harvesting conditions
- inspect yield monitoring and satellite-based yield mapping components

 Sprayers and Applicators - Theory describe the pneumatic suspension systems describe the operation of sprayer and applicator systems identify the steps for safe handling of chemicals Sprayers and Applicators – Shop perform pre-delivery and inspection of sprayers 	15 hours 15 hours
perform pre-delivery and inspection of sprayers	15 hours
 inspect pneumatic suspension systems inspect sprayer systems calibrate sprayer systems 	
 Powertrains 2 - Theory describe various gearbox types describe planetary drives, bull pinion and front wheel assist axles discuss steering geometry describe advanced brake systems 	15 hours
 Powertrains 2 - Shop inspect various gearbox types inspect front wheel assist axle assemblies inspect steering geometry inspect inboard and outboard final drives inspect hydraulic brake components inspect brake assemblies 	15 hours

safety

- planning and communication
- operational testing
- scheduled maintenance

For details regarding the In Context Topic, see page 25



Leve	l Three	8 weeks	240 hours
• • • •	cal and Electronics - Theory identify electrical schematics describe the operation of control ci describe the operation of circuit pro- describe the operation of sensor ci describe the operation of controller describe the four faults in an electr explain Controller Area Network (C	otection devices rcuits rs ical system	15 hours
Electri • • • • •	cal and Electronics – Shop perform test procedures perform circuit protection tests perform sensor circuits tests test controllers troubleshoot the four faults in an el troubleshoot electrical systems usi	-	15 hours
Diesel • • • • • •	Fuel System Diagnostics - Th discuss the removal and installatio compare injection system timing m discuss turbochargers explain the removal and installation discuss fuel delivery control metho discuss emission control process discuss methods used to diagnose	n of injection system components ethods n of electronic injectors	30 hours
Diesel • • • • • •	Fuel System Diagnostics - Sh complete the removal and installati perform injection system timing analyze fuel system components evaluate turbochargers perform the removal and installatio troubleshoot electronic fuel system troubleshoot emission system com perform diagnosis and repair of fue	ion of injection components in of electronic injectors. is ponents	30 hours
Hydrau • • •	ulic Systems - Theory describe the operation of a hydrost describe the operation of a power b describe pneumatic and hydraulic describe the operation of a 3-point describe the operation of a hydrost	brake system trailer braking systems hitch system	15 hours
Hydrau • • •	ulic Systems – Shop evaluate steering control valves evaluate power brake control valve evaluate 3-point hitch components evaluate hydrostatic transmission o		15 hours
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 Powertrains 3 Advanced - Theory describe standard gear transmissions describe power shift transmissions describe transmission diagnostics procedures describe continuously variable transmission (CVT) operation describe CVT calibration 	30 hours
 Powertrains 3 Advanced – Shop perform the disassembly and inspection of gear transmissions and transfer cases perform the disassembly and inspection of power shift transmissions diagnose power shift transmission components Calibrate continuously variable transmission (CVT) 	30 hours
 Welding - Theory describe the safe assembly, operations, shut down and equipment for oxy-fuel cutting (OFC) and plasma arc cutting (PAC) describe the safe assembly, operations, shut down and equipment for Gas Metal Arc Welding (GMAW) describe the safe assembly, operations, shut down and equipment for Shield Metal Arc Welding (SMAW) 	30 hours
 Welding – Shop demonstrate the safe set up, operation and maintenance when performing oxy-fuel cutting (OFC) demonstrate the safe set up, operation and maintenance when plasma arc cutting (PAC) demonstrate the safe set up, operation and maintenance when performing Gas Metal Arc Welding (GMAW) in multiple positions on various gauges of metal demonstrate the safe set up, operation and maintenance when performing Shield Metal Arc Welding (SMAW) 	30 hours

Level Three topics that are taught in context:

- safety •
- planning and communication •
- operational testing
- scheduled maintenance •

For details regarding the in Context Topic, see page 25



Leve	Four	8 weeks		240 hours
• • •	identify faulty communi identify faulty electrical	s of communication systems	toring	30 hours
•	procedures analyze information rec repair faulty communic	uipment to machinery following manufact		30 hours
	discuss the use of seal	and sleeves nponents crankshaft and bearings ling components beners, flywheels and inertia balancers		30 hour
	evaluate sealing comp	s and sleeves mponents k, crankshaft and bearings onents peners, flywheels and inertia balancers		30 hour
•	Ilic System Diagnos interpret hydraulic syst analyze hydraulic sche analyze hydrostatic dri	em test procedures ematic diagrams		30 hours
Hydrau • •	l lic System Diagnos develop a diagnostic pl	stics – Shop lan and record sheet powertrain system diagnostics		30 hours
•	ery Diagnosis - The describe the diagnostic Conditioning (HVAC) s	c procedures for Heating, Ventilation an	d Air	15 hour
• Machin	describe diagnostic pro ery Diagnosis – Sh	ocedures for agricultural equipment	litioning	15 hour
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• analyze the operation of agricultural equipment

Equipment Performance - Theory

- evaluate clutches, steering, brakes, differentials, and planetaries
- evaluate the importance of pre-delivery procedures
- compare methods of ballasting tractors
- evaluate the use of the dynamometer to test horse power and torque
- plan diagnostic procedures
- evaluate the importance of pre-delivery procedures

Equipment Performance – Shop

- use a dynamometer
- evaluate torque and horsepower curves

Level Four topics that are taught in context:

- safety
- planning and communication
- operational testing
- scheduled maintenance

For details regarding the In Context Topic, see page 25



15 hours

IN CONTEXT TOPICS

In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

Safety

- uses personal protective equipment (PPE) and safety equipment
- maintains a safe work environment

Planning and Communication

- communications with others
- plans daily tasks

Operational Testing

- conducts operational tests
- performs failure analysis

Scheduled Maintenance

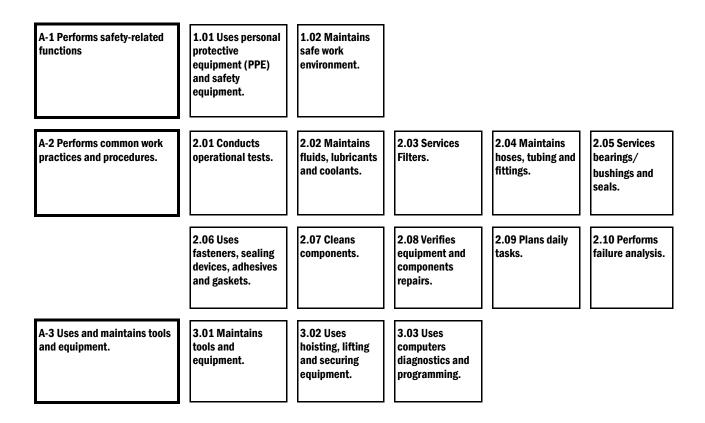
- maintains fluids, lubricants and coolants
- service filters
- maintain hoses, tubing and fittings
- service bearings/bushings and seals
- uses fasteners, sealing devices, adhesives and gaskets



AGRICULTURAL EQUIPMENT TECHNICIAN TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2012 Agricultural Equipment Technician National Occupational Analysis (NOA). Each sub-task details the corresponding essential skill and level of training (apprenticeship year) where the content is delivered in training.

A - PERFORMS COMMON OCCUPATIONAL SKILLS



B – ENGINES AND ENGINE SUPPORT SYSTEMS

B-4 Diagnoses engine and engine support systems.

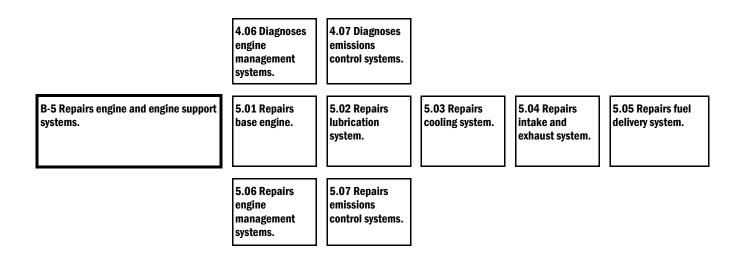
4.01 Diagnoses base engine. 4.02 Diagnoses lubrication system 4.03 Diagnoses cooling system.

4.04 Diagnoses intake and exhaust system.

4.05 Diagnoses fuel delivery system.

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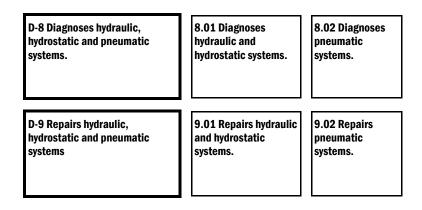




C – **DRIVE TRAIN**

C-6 Diagnoses drive train.	6.01 Diagnoses dry clutches.	6.02 Diagnoses driveline systems and components.	6.03 Diagnoses wet clutches, transmissions and gear cases.	6.04 Diagnoses differentials and final drives.
C-7 Repairs drive train.	7.01 Repairs dry clutches.	7.02 Repairs driveline systems and components.	7.03 Repairs wet clutches, transmissions and gear cases.	7.04 Repairs differentials and final drives.

D – HYDRAULIC, HYDROSTATIC AND PNEUMATIC SYSTEMS

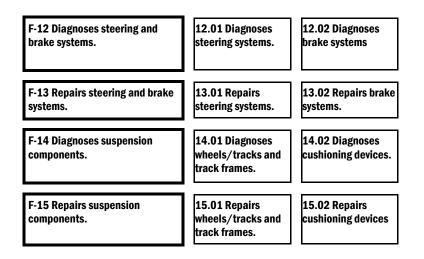




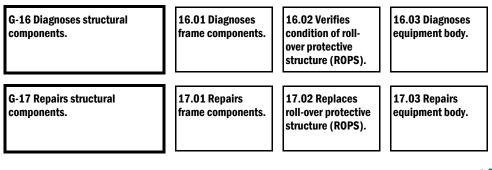
E – ELECTRICAL AND ELECTRONIC SYSTEMS

E-10 Diagnoses electrical/electronic power and control monitoring systems.	10.01 Diagnoses electrical power and control monitoring systems.	10.02 Diagnoses electronic power and control monitoring systems.
E-11 Repairs electrical/electronic power and control monitoring systems.	11.01 Repairs electrical power and control monitoring systems.	11.02 Repairs electronic power and control monitoring systems.

F – STEERING, SUSPENSION AND BRAKES



G – STRUCTURAL COMPONENTS AND OPERATOR STATION



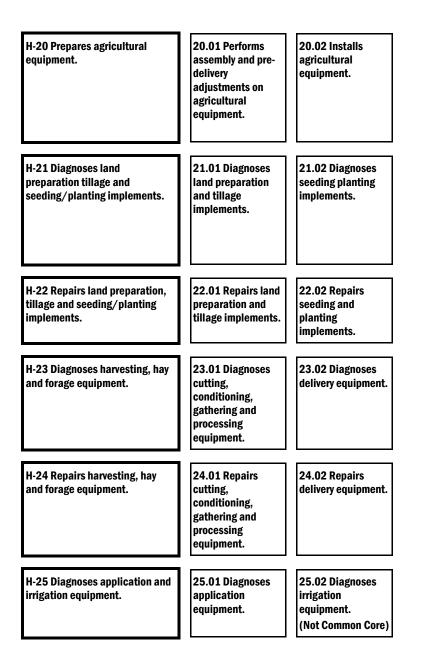
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G-18 Diagnoses climate control systems.	18.01 Diagnoses heating and ventilation systems.	18.02 Diagnoses air conditioning systems.
G-19 Repairs climate control systems.	19.01 Repairs heating and ventilation systems.	19.02 Repairs air conditioning systems.

H – AGRICULTURAL EQUIPMENT





H-26 Repairs application and irrigation equipment.	26.01 Repairs application equipment.	26.02 Repairs irrigation equipment. (Not Common Core)
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*The Agricultural Equipment Technician National Occupational Analysis (NOA), describing the "full scope" of the trade, can be found at <u>www.red-seal.ca.</u>

For more detailed information on course content, please refer to the Agricultural Equipment Technician Guide to Course Content at www.saskapprenticeship.ca.

