COURSE OUTLINE: TCT712 - ENGINE SYSTEMS

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Course Code: Title	TCT712: ENGINE SYSTEMS
Program Number: Name	6081: T/C TECHN LEVEL II
Department:	MOTIVE POWER APPRENTICESHIP
Semesters/Terms:	20F
Course Description:	Upon successful completion the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder heads, valve trains, and gasoline engines.
Total Credits:	5
Hours/Week:	5
Total Hours:	40
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
Essential Employability Skills (EES) addressed in this course:	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.
General Education Themes:	Science and Technology
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation &	Assignments related to theory and appropriate application skills.

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.

Assessment Requirements:

Proctored final exam.
Periodic quizzes.

Grade
Definition Grade Point Equivalent
A+ 90 - 100% 4.00
A 80 - 89%
B 70 - 79% 3.00
C 60 - 69% 2.00
D 50 - 59% 1.00
F (Fail)49% and below 0.00

CR (Credit) Credit for diploma requirements has been awarded.
S Satisfactory achievement in field /clinical placement or non-graded subject area.
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR Grade not reported to Registrar`s office.
W Student has withdrawn from the course without academic penalty.

Books and Required Resources:

medium/heavy duty truck engines,fuels and computerized management systems by Sean Bennett
Publisher: cengage Edition: 5th

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
Upon successful completion, the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder heads and valve trains. Upon successful completion, the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder block assemblies. Upon successful completion, the apprentice is able to understand the principles of operation, diagnose and repair gasoline engines.	LEARNING OUTCOMES AND CONTENT Upon successful completion, the apprentice is able to: 2.1.1 Explain the purpose and fundamentals of diesel cylinder heads and valve trains. [2/0] - engine theory - cylinder breathing - gas dynamics - thermodynamics - cooling systems 2.1.2 Identify the functions, construction, composition, types, styles and application of diesel cylinder heads and valve trains. [4/0] - cylinder head castings - valves - cross flow configurations - parallel port configurations - cylinder head castings - valves - cross flow configurations - parallel port configurations - seats - valve rotators

		- guides - seals - springs - valve trains - rocker assemblies - push rods - lifters - compression brake mounting - variable valve timing mounting - camshafts - cylinder block mounted - overhead - double overhead - drive mechanisms - injector sleeves and fuel manifolds - hydraulic - TP - EUI - HEUI - EHI 2.1.3 Describe the principle(s) of operation of diesel cylinder heads and valve trains using both assembled and disassembled components. [6/0] - cylinder head castings and integral components - valves - seats - rotators - guides - seals - springs - rocker assemblies - volumetric efficiency - breathing efficiencies - cross flow - parallel port design - valve trains - push rods - lifters - camshafts - overhead - double overhead - dampening mechanisms - drive mechanisms - cylinder head cooling - cylinder head lubrication - injector sleeves 2.1.4 Perform inspection, testing and diagnostic procedures on diesel engine cylinder heads and valve trains.

[0/2]
- hot and cold hydrostatic testing
- interpret valve timing diagrams
- set valve timing
- perform over-head adjustments
- verify true top dead center
- injector sleeve leakage tests
- check valve height and seating
- check cylinder head warp age

2.1.5 Recommend reconditioning or repairs following manufacturer` s procedures on diesel engine cylinder heads and valve trains.

[0/3]
- dismantle and reassemble cylinder heads
- demonstrate/ perform
- valve dressing
- seat installation
- seat to valve fit
- valve guide service
- injector sleeve replacement
- measuring cylinder head
- measuring valve train components
- cylinder head replacement procedure

GENERAL LEARNING OUTCOME

Upon successful completion, the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder block assemblies.

LEARNING OUTCOMES AND CONTENT

Upon successful completion, the apprentice is able to:

2.2.1 Explain the purpose and fundamentals of diesel engine cylinder block assemblies.

[2/0]
- engine block and powertrain assemblies
- bore
- stroke
- engine displacement

2.2.2 Identify the functions, construction, composition, types, styles and application of diesel engine cylinder block assemblies.

[4/0]
- cylinder block
- sleeves
- top deck surface

		- counter bore - flywheel - vibration dampers - crankshaft - connecting rods - cracked/ fractured rod technology - off set big end - piston pins - pistons - aluminum trunk style - articulating - cross-head - steel trunk - piston cooling nozzles - bearings - camshaft - crankshaft - combustion chambers - direct injection - gear train - gear train plates 2.2.2 Describe the principle(s) of operation of diesel engine cylinder block assemblies using assembled and disassembled components. [5/0] - cylinder block - sleeved - parent bore - torque twist limitation - sleeves - wet - dry - mid stop - top deck surface - counter bore - flywheel - single mass - dual mass - vibration dampers - crankshaft - connecting rods - piston pins - pistons - combustion chambers - direct injection requirements - counter balance device 2.2.4 Perform inspection, testing and diagnostic procedures on diesel engine cylinder block assemblies. [0/3]

		- measuring / serviceability checks on: - crankshaft - piston - sleeve (liner) - protrusion - fit - cylinder block - block bore - liner bore - thread condition - crack detection techniques - magnetic flux testing - dye penetrant - rod side clearance and alignment - ring side clearance and end gap - piston cooling jet alignment - crankshaft - endplay - bearing clearances - surface condition - throw radii - mains radii - oil hole chamfer - measuring practices 2.2.5 Recommend reconditioning or repairs following manufacturers` procedures on diesel engine cylinder block assemblies. [1/2] - cleaning diesel engine cylinder blocks - oil passages - coolant passages - external surfaces - outline block machining practices - major component reconditioning procedures - assembly procedure - bearings - pistons - rings - valves - camshafts - crankshafts - deck damage - piston cooling jets - cylinder liners - parent bores - lubrication failures LEARNING OUTCOMES AND CONTENT Upon successful completion, the apprentice is able to:

2.3.1 Explain the purpose and fundamentals of gasoline and alternate fuel engines and compare with diesel engines.

[0.5/0]
- bore
- stroke
- engine displacement
- mechanical efficiency
- indicated power
- thermal efficiency
- volumetric efficiency

2.3.2 Identify the functions, construction, and application of gasoline and alternate fuel engines.

[1/0]
- lubrication
- cooling
- induction
- exhaust
- fuel systems
- gasoline
- propane
- compressed natural gas (CGI)
- fuel sub-systems
- emission control devices
- spark ignition
- combustion chambers

2.3.3 Describe the principle(s) of operation of gasoline and alternate fuel engines using assembled engines and components.

[2.5/0]
- lubrication
- cooling
- induction
- exhaust
- fuel systems
- air fuel ratio
- fuel sub-system
- emission
- combustion chambers
- thermal efficiency

2.3.4 Perform inspection, testing and diagnostic procedures on gasoline and alternate fuel engines.

[0/1]
- identify types of gasoline and alternate fuel engines
- outline service procedures
- air inlet restriction
- fuel pressure

	- compression - identify engine serial and code date 2.3.5 Recommend reconditioning or repairs following manufacturers` procedures on gasoline and alternate fuel engines. [0/1] - outline OEM requirements for servicing different engines - locate procedure for engine service in OEM service literature - outline procedure for servicing cooling systems, fuel, oil and air filters on a gasoline and alternate fuel engines

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
assignments	20%
practical application testing	30%
theory testing	50%

Date: October 6, 2020

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.