



## COURSE OUTLINE: TCT712 - ENGINE SYSTEMS

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<b>Course Code: Title</b>	TCT712: ENGINE SYSTEMS
<b>Program Number: Name</b>	6081: T/C TECHN LEVEL II
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Semesters/Terms:</b>	19S
<b>Course Description:</b>	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.
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	40
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Essential Employability Skills (EES) addressed in this course:</b>	<p>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.</p> <p>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>EES 3 Execute mathematical operations accurately.</p> <p>EES 4 Apply a systematic approach to solve problems.</p> <p>EES 5 Use a variety of thinking skills to anticipate and solve problems.</p> <p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>
<b>General Education Themes:</b>	Science and Technology
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	Assignments related to theory and appropriate application skills. Proctored final exam. Periodic quizzes.  Grade Definition Grade Point Equivalent



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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
<p>Upon successful completion, the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder heads and valve trains.</p> <p>Upon successful completion, the apprentice is able to understand the principle of operation, diagnose and repair diesel engine cylinder block assemblies.</p> <p>Upon successful completion, the apprentice is able to understand the principles of operation, diagnose and repair gasoline engines.</p>	<p>LEARNING OUTCOMES AND CONTENT</p> <p>Upon successful completion, the apprentice is able to:</p> <p>2.1.1 Explain the purpose and fundamentals of diesel cylinder heads and valve trains.</p> <p>[2/0] - engine theory          - cylinder breathing          - gas dynamics          - thermodynamics          - cooling systems</p> <p>2.1.2 Identify the functions, construction, composition, types, styles and application of diesel cylinder heads and valve trains.</p> <p>[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</p>



- compression brake mounting
- variable valve timing mounting
- camshafts
- cylinder block mounted
- overhead
- double overhead
- drive mechanisms
- injector sleeves and fuel manifolds
- hydraulic
- TP
- EUJ
- HEUJ
- 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	Course Outcome Assessed
assignments	20%	



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	practical application testing	30%	
	theory testing	50%	

**Date:** April 1, 2019

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

