



## DEM231 Diesel Engines I

### Course Information

Credits	5
Campus	Washburn Institute of Technology
Address	5724 SW Huntoon
City/State/Zip	Topeka, Kansas 66604
Office Fax	785-273-7080

### Description

Diesel Engines I introduces the theory of operation and the use of the engine's mechanical components; disassembling, inspecting, measuring, reassembling and performing maintenance procedures on diesel engines. (KBOR Aligned)

Experience in disassembling, reassembling, cleaning and inspection techniques are covered in a instructor-led teardown, inspections, and reassembly of a running 2 cylinder Kubota diesel engine. Measurement and inspection techniques as well as the principles, importance and performance of routine and preventative maintenance is emphasized.

### Textbooks

**MHT - Shrink-wrapped Package: Tasksheet Manual Includes Systems & Engines / TWO Year Online Access Pack** Publisher: CDX 9781284099874

#### OPTIONAL (in addition to above):

Fundamentals of Medium/Heavy Duty Commercial Vehicle Systems <i>Text-Hard (paper) edition</i>	CDX 9781284041163
Fundamentals of Medium/Heavy Duty Diesel Engines <i>Text-Hard (paper) edition</i>	CDX 9781284067057

### Student Learning Outcomes:

- A. Communicate effectively
- B. Integrate technology
- C. Learn effectively
- D. Demonstrate cooperative teamwork skills
- E. Apply safety in the workplace
- F. Think critically and creatively
- G. Demonstrate responsible work ethics

## Competencies

Rating	Tasks Covered in this Course	Source
XXX	<b>Diesel Engines I (KBOR Aligned Tasks)</b>	KBOR
	1. Identify cylinder head, camshaft & valve train	KBOR
	2. Operate cylinder head, camshaft & valve train	KBOR
	3. Identify cylinder block	KBOR
	4. Reassemble cylinder block	KBOR
	5. Identify lubrication system	KBOR
	6. Reassemble lubrication system	KBOR
	7. Identify cooling system	KBOR
	8. Reassemble cooling system	KBOR
	9. Identify internal engine components	KBOR
	10. Reassemble internal engine components	KBOR
	11. Identify proper use of sealing mediums	KBOR
	12. Install proper use of sealing mediums	KBOR
	13. Demonstrate proper use of sealing mediums	KBOR
	14. Identify timing procedures	KBOR
	15. Demonstrate timing procedures	KBOR
XXX	<b>For every task in Diesel Engines, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.</b>	NATEF
XXX	<b>The first task in Diesel Engines is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.</b>	NATEF
XXX	<b>I. DIESEL ENGINES</b>	NATEF
XXX	<b>A. General</b>	NATEF
	1. Inspect fuel, oil, Diesel Exhaust Fluid (DEF) and coolant levels, and condition; determine needed action.	P-1
XXX	<b>B. Cylinder Head and Valve Train</b>	NATEF
	1. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.	P-2

	2. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.	P-3
	3. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.	P-3
	4. Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action.	P-3
	5. Inspect valve train components; determine needed action.	P-1
	6. Reassemble cylinder head.	P-3
	7. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.	P-3
	8. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.	P-1
	9. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.	P-2
<b>XXX</b>	<b>C. Engine Block</b>	<b>NATEF</b>
	1. Perform crankcase pressure test; determine needed action.	P-1
	2. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.	P-2
	3. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.	P-2
	4. Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.	P-2
	5. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.	P-2
	6. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).	P-2
	7. Inspect in-block camshaft bearings for wear and damage; determine needed action.	P-3
	8. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.	P-3
	9. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.	P-2
	10. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.	P-2
	11. Inspect, install, and time gear train; measure gear backlash; determine needed action.	P-2
	12. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.	P-3

	13. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.	P-3
	14. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.	P-2
	15. Check condition of piston cooling jets (nozzles); determine needed action.	P-2
	16. Inspect crankshaft vibration damper; determine needed action.	P-3
	17. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-3
	18. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.	P-2
<b>XXX</b>	<b>D. Lubrication Systems</b>	NATEF
	3. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.	P-3
	4. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.	P-3
	5. Inspect, clean, and test oil cooler and components; determine needed action.	P-3
	7. Determine proper lubricant and perform oil and filter change.	P-1
<b>XXX</b>	<b>B. Tools and Equipment (Supplemental Tasks- NATEF)</b>	NATEF
	2. Identify standard and metric designation.	n/a
	3. Demonstrate safe handling and use of appropriate tools.	n/a
	5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).	n/a
<b>XXX</b>	<b>The first task in Preventive Maintenance is to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.</b>	NATEF
<b>XXX</b>	<b>A. Engine System (PMI Tasks - NATEF)</b>	NATEF
<b>XXX</b>	<b>1. Engine (PMI Tasks - NATEF)</b>	NATEF
	1. Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.	P-1
	2. Inspect vibration damper.	P-1
	3. Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.	P-1
	4. Check engine oil level and condition; check dipstick seal.	P-1
	5. Inspect engine mounts for looseness and deterioration.	P-1
	7. Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.	P-1

<b>XXX</b>	<b>2. Fuel System (PMI Tasks - NATEF)</b>	
	1. Check fuel tanks, mountings, lines, caps, and vents.	P-1
	2. Drain water from fuel system.	P-1
	3. Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.	P-1
<b>XXX</b>	<b>3. Air Induction and Exhaust System (PMI Tasks - NATEF)</b>	NATEF
	1. Check exhaust system mountings for looseness and damage.	P-1
	6. Service or replace air filter as needed; check and reset air filter restriction indicator.	P-1
	7. Inspect and service crankcase ventilation system.	P-1
<b>XXX</b>	<b>4. Cooling System (PMI Tasks - NATEF)</b>	
	2. Inspect radiator (including air flow restriction, leaks, and damage) and mountings.	P-1
	3. Inspect fan assembly and shroud.	P-1
	5. Inspect coolant hoses and clamps.	P-1
	6. Inspect coolant recovery system.	P-1
	7. Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).	P-1
	8. Service coolant filter.	P-1
	9. Inspect water pump.	P-1
<b>XXX</b>	<b>5. Lubrication System (PMI Tasks - NATEF)</b>	
	1. Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.	P-1
	2. Take an engine oil sample for analysis.	P-1

## **Guidelines for Success** (See Program Syllabus for additional information.)

### **Assessment Plan**

Assessment is an integral part of the educational process at Washburn Tech and accurate feedback is an important tool in continuously improving the institution's technical programs. Students can expect to participate in assessment activities prior to entry into programs, within specific courses and following program completion for specific fields of study.

### **Grading Rationale**

Student progress is evaluated by means that include, but not limited to:

- Lab Work (40%)
- Professional Behavior (30%)
- Classroom Activities/Homework (10%)
- Quizzes & Tests (10%)
- Final Exams (10%)

### **Grading Scale**

90-100% A  
80-89% B  
70-79% C  
60-69% D  
59% or less F

### **Attendance**

Attendance is a key part of success in the program and in the workplace. Students are to arrive for class on time and be prepared to learn. Absences or tardiness will negatively impact grades. Missed time cannot be made up. Many assignments and labs cannot be "made-up" if missed. The options to make-up missed work or to accept late work is at the discretion of the instructor.

### **Disability**

The Americans with Disabilities Act (ADA) Office is responsible for assisting in arranging accommodations and for identifying resources at Washburn Institute of Technology for persons with disabilities. Qualified students with disabilities MUST self-identify by completing an application. In addition students must provide appropriate medical documentation to the ADA coordinator to be eligible for accommodations. New requests for accommodations should be submitted at least two months or more prior to the date the accommodations are needed. However, please contact the ADA office as soon as a need may arise. Depending on the accommodation request, four to eight weeks lead time may be needed for timely and effective provision of accommodations.

The ADA Office coordinates and assists in arranging accommodations it deems appropriate for eligible students on a case-by-case basis. If you are a student with a disability that may substantially limit your ability to participate in any of our classes and you believe that you will need accommodations, it is your responsibility to contact:

### **ADA Coordinator**

**Phone: 785-670-3365 Email: [gloria.christian@washburn.edu](mailto:gloria.christian@washburn.edu)**

It is the policy of Washburn Institute of Technology to assure equal employment and educational opportunity to qualified individuals without regard to race, color, sex, age, ancestry, marital or parental status, disability, religion, national origin, or sexual orientation/gender identity. Contact Pam Foster, Morgan Hall, Room Washburn University (785-670-1509), and [pam.fosterel@washburn.edu](mailto:pam.fosterel@washburn.edu)