

# Minnesota State College Southeast

## **AUTO 1111: Gas and Diesel Engine Repair Lab**

### **A. COURSE DESCRIPTION**

Credits: 4

Lecture Hours/Week: \*.\*

Lab Hours/Week: 8

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: None

In this course an engine will be disassembled, the parts identified, checked, and measured. The engine will then be reconditioned and assembled. (Prerequisites: AUTO1105, AUTO1106, AUTO1201, or instructor permission) (4 Credits: 0 lecture/4 lab)

**B. COURSE EFFECTIVE DATES:** 04/27/1998 - Present

### **C. OUTLINE OF MAJOR CONTENT AREAS**

1. General Engine Diagnosis; Removal and Reinstallation (R & R)
2. Cylinder Head and Valve Train Diagnosis and Repair
3. Engine Block Assembly Diagnosis and Repair
4. Lubrication and Cooling Systems Diagnosis and Repair

**D. LEARNING OUTCOMES (General)**

1. Identify and interpret engine concern; determine necessary action. P-1
2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1
3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
5. Diagnose engine noises and vibrations; determine necessary action. P-2
6. Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action. P-2
7. Perform engine vacuum tests; determine necessary action. P-1
8. Perform cylinder power balance tests; determine necessary action. P-1
9. Perform cylinder compression tests; determine necessary action. P-1
10. Perform cylinder leakage tests; determine necessary action. P-1
11. Remove cylinder head(s); visually inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition. P-2
12. Install cylinder heads and gaskets; tighten according to manufacturer's specifications and procedures. P-1
13. Inspect valve springs for squareness and free height comparison; determine necessary action. P-2
14. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks, and valve grooves; determine necessary action. P-2
15. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action. P-3
16. Inspect valves and valve seats; determine necessary action. P-3
17. Check valve face-to-seat contact and valve seat concentricity (runout); determine necessary action. P-3
18. Check valve spring assembled height and valve stem height; determine necessary action. P-3
19. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2
20. Inspect hydraulic or mechanical lifters; determine necessary action. P-2
21. Adjust valves (mechanical or hydraulic lifters). P-1
22. Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear); determine necessary action. P-2
23. Inspect and replace timing belts (chains), overhead camdrive sprockets, and tensioners; check belt/chain tension; adjust as necessary. P-1
24. Inspect camshaft for runout, journal wear and lobe wear. P-2
25. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action. P-3
26. Establish camshaft(s) timing and cam sensor indexing according to manufacturer's specifications and procedures. P-1
27. Disassemble engine block; clean and prepare components for inspection and reassembly. P-2
28. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action. P-2
29. Inspect internal and external threads; restore as needed (includes installing thread inserts). P-2
30. Inspect and measure cylinder walls for damage, wear, and ridges; determine necessary action. P-2
31. Deglaze and clean cylinder walls. P-2
32. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action. P-3

33. Inspect crankshaft for end play, straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure journal wear; check crankshaft sensor reluctor ring (where applicable); determine necessary action. P-2
34. Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selection of bearings). P-2
35. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition. P-3
36. Inspect and measure pistons; determine necessary action. P-2
37. Remove and replace piston pin. P-3
38. Inspect, measure, and install piston rings. P-1
39. Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time. P-
40. Inspect or replace crankshaft vibration damper (harmonic balancer). P-3
41. Assemble the engine using gaskets, seals, and formed-in-place (tube-applied) sealants, thread sealers, etc. according to manufacturer's specifications. P-2
42. Perform oil pressure tests; determine necessary action. P-1
43. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action. P-2
44. Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action. P-1
45. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
46. Inspect and replace engine cooling and heater system hoses. P-1
47. Inspect, test, and replace thermostat and housing. P-2
48. Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1
49. Inspect, test, remove, and replace water pump. P-1
50. Remove and replace radiator. P-2
51. Inspect and test fans (electrical or mechanical), fan clutch, fan shroud, and air dams. P-2
52. Inspect auxiliary oil coolers; determine necessary action. P-3
53. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2
54. Perform oil and filter change. P-2
55. Maintain an orderly work area
56. Exhibit professionalism

#### **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

None

#### **F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

#### **G. SPECIAL INFORMATION**

None noted