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