

COCONINO COMMUNITY COLLEGE

COURSE OUTLINE

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Status: Permanent

Date: Sept. 2, 2004

A. Identification:

1. Subject Area: Automotive Technology
2. Course Number: AUT 106
3. Course Title: Automotive Engines
4. Credit Hrs: 3
5. Catalog Description: An overview of the design, operation, diagnosis and service procedures of modern automotive engines. Students participate in the disassembly, inspection and reassembly. Service and technical data are presented to prepare the students for practical experience in engine servicing. Prerequisites: AUT 100 or consent of instructor. Two lecture. Two lab. May be taken for S/U credit.

B. Course Goals:

To provide students with a fundamental understanding and initial hands-on experiences with Automotive Shop Safety, Tools and Equipment, Engine Theory & Design, Engine Problem Diagnosis, Engine Component Inspection & Diagnosis, and Engine Component Repair or Replacement.

C. Course Outcomes:

Students will:

1. Remove and replace engine mounts.
2. Remove and replace engine (front wheel and rear wheel drive).
3. Communicate with customer and verify complaint. Determine needed repairs.
4. Inspect engine assembly for fuel coolant, oil and other leaks, broken or missing components and modifications; then determine needed repairs.
5. Diagnose engine noises and determine needed repairs.
6. Determine the cause of excessive oil consumption, unusual engine exhaust (odor, color, sound) and select needed repairs.
7. Perform the following diagnostic tests, evaluate the results and determine needed repairs
 - a. Engine balance test
 - b. Power balance test
 - c. Compression test
 - d. Cylinder leakage test
 - e. Oil pressure tests
 - f. Cooling system tests
 - g. 4 gas analysis
 - h. Scope analysis

8. Remove cylinder heads: visually and “magnaflux” inspect cylinder heads for cracks, gasket surface areas for warpage and leakage, and check passage condition.
9. Install cylinder heads and gaskets: tighten in accordance with manufacturer’s specifications and procedures.
10. Inspect and test valve springs for squareness, pressure, and free height comparison: replace as necessary.
11. Inspect valve spring retainers, locks, and valve lock grooves.
12. Replace valve stem seals.
13. Inspect valve guides for wear; check valve guide height and stem-to-guide clearance: recondition/replace as necessary.
14. Inspect valves: reface or replace.
15. Inspect valve seats: reface or replace.
16. Check valve spring assembled height and valve stem height: service valve and spring assemblies as necessary.
17. Inspect pushrods, rocker arms, rocker arm pivots, and shafts for wear, bending, cracks, looseness, and blocked oil passages: repair or replace.
18. Inspect, test, and replace hydraulic or mechanical lifters.
19. Adjust valves on engines with mechanical and hydraulic lifters.
20. Inspect and replace camshaft drives (includes checking gear wear and backlash, sprocket and chain wear, overhead cam drive sprockets, drive belts, belt tension, and tensioners).
21. Inspect and measure camshaft journals and lobes.
22. Inspect and measure camshaft bearing surfaces for damage, out-of-round, and alignment; determine needed repairs.
23. Measure camshaft timing.
24. Inspect and replace pans, covers, gaskets, and seals.
25. Visually inspect engine block for cracks, passage condition, core and gallery plug condition, and surface warpage; service block or determine needed repairs.
26. Inspect and repair damaged threads.
27. Inspect and measure cylinder walls for damage and wear; determine needed repairs.
28. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed repairs.
29. Install camshaft bearings.
30. Inspect crankshaft for surface cracks and journal damage; check oil passage condition; measure journal wear and service crankshaft or determine needed repair.
31. Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine needed repairs including the proper selection of bearings.
32. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.
33. Inspect, measure, service, or replace pistons.
34. Inspect, measure and install piston rings.
35. Inspect, repair or replace crankshaft vibration damper (harmonic balance).
36. Inspect crankshaft flange and flywheel for burrs; repair as necessary.
37. Inspect flywheel for cracks, wear (includes flywheel ring gear), and measure flywheel rubout; determine needed repairs.

38. Reassemble engine parts using correct gaskets and sealers.
39. Inspect auxiliary shaft(s) (also know as balance, intermediate, idler, counterbalance or silencer shafts); inspect shafts and support bearings for damage and wear; determine needed repairs, reinstall and time.
40. Prime engine lubrication system.
41. Inspect, measure, repair, or replace oil pumps (includes gears, rotors, and housing), pressure relief devices, and pump drives.
42. Perform oil change on turbo charged engine. (Note: special procedures must be followed).
43. Inspect exhaust system, evaluate and repair.
44. Remove cylinder wall ridges.
45. Hone and clean cylinder walls.
46. Install new piston pins and bushings (as machine shop).
47. Inspect, remove and replace crankshaft pilot bearing/bushing (as applicable).
48. Inspect, replace engine cooling and heater system hoses.
49. Inspect, test, and replace oil temperature/pressure switches and sensors.
50. Inspect and replace engine cooling and heater system hoses.
51. Inspect, test, and replace thermostat, by-pass, and housing.
52. Inspect and test coolant; flush, refill, and bleed cooling system with recommended coolant.
53. Inspect, test, and replace water pump.
54. Inspect, test, and replace radiator, pressure cap, and coolant recovery system.
55. Clean, inspect, test, and replace fans (electrical/mechanical), fan clutch, fan shroud, and cooling system related temperature sensors/switches.
56. Inspect, test, repair or replace auxiliary oil coolers.
57. Remove and replace distributor and time engine.

D. Course Content:

Will include:

Besides the above performance competencies course content will also include:

1. Automotive Shop Safety
2. Tools and equipment
3. Engine Theory & Design
4. Engine Problem Diagnosis
5. Engine Component Inspection & Diagnosis
6. Engine Component Repair or Replacement