JEFFERSON COLLEGE

COURSE SYLLABUS

AUT151

AUTOMOTIVE ENGINE REPAIR

1 Credit Hour

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Revised by: Gerard Uhls
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AUT151 Automotive Engine Repair

I. CATALOGUE DESCRIPTION

A. Pre-requisite: AUT100 Automotive Shop Safety with a grade of "C" or better
AUT141 Automotive Steering and Suspension Systems with a grade of "C" or better
AUT142 Automotive Steering and Suspension Systems Lab with a grade of "C" or better
Reading Proficiency
Co-requisite: AUT152 Automotive Engine Repair Lab

B. 1 Semester Credit Hour

C. Automotive Engine Repair is the study of the design and construction of automotive engines. The emphasis is on theory and operation of the modern automotive engine. The course will focus on function and operation of internal engine components. Information will include cylinder block design, cylinder head design, variable valve timing, crankshaft design, combustion chamber design, and various other applications of technology in the modern engine. Completion of this course will help prepare the student for entry level employment and assist the student in preparing for the National Institute for Automotive Service Excellence (ASE) Engine Repair test (A1). (S, SU)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

A. General Engine Diagnosis; Removal and Reinstallation (R & R)		
Demonstrate an understanding of completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of researching applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

Demonstrate understanding of Verification of the instrument panel engine warning indicators	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting engine assembly for fuel, oil, coolant, and other leaks; determine necessary action	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate understanding of installing engine covers using gaskets, seals, and sealers as required	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate understanding of removing and replacing timing belt; verify correct camshaft timing	P-1	Classroom Discussion Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate understanding of performing common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert	P-1	Classroom Discussion, Lecture Classroom Exercises Reading Assignments Tests
Demonstrate understanding of inspecting, removing and replacing engine mounts	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments, Tests
Demonstrate understanding of identifying hybrid vehicle internal combustion engine service precautions	P-3	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of removing and reinstalling an engine in an OBDII or newer vehicle; discuss reconnecting all attaching components and restoring the vehicle to running condition	P-3	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

B. Cylinder Head and Valve Train Diagnosis and Repair		
Demonstrate an understanding of cylinder head removal; inspecting gasket condition; installing cylinder head and gasket; tightening according to manufacturer's specifications and procedures	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

Demonstrate an understanding of cleaning and visually inspecting a cylinder head for cracks; check gasket surface areas for warpage and surface finish and checking passage condition	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting valve springs for squareness and free height comparison; determine necessary action		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of replacing valve stem seals on an assembled engine; inspecting valve spring retainers, locks/keepers, and valve lock/keeper grooves		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting valve guides for wear, checking valve stem-to-guide clearance		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting valves and valve seats for proper sealing		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate understanding of valve and seat machining		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of checking valve spring assembled height and valve stem height		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices)	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of adjusting valves (mechanical or hydraulic lifters)	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

Demonstrate an understanding of inspecting and replacing camshaft and drive belt/chain (includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting and/or measure camshaft for runout, journal wear and lobe wear		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting camshaft bearing surface for wear, damage, out-of- round, and alignment; determine necessary action		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of establishing camshaft position sensor indexing	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

C. Engine Block Assembly Diagnosis and Repair		
Demonstrate the knowledge of removing, inspecting, or replacing crankshaft vibration damper (harmonic balancer)	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of disassembling engine block, cleaning and preparing components for inspection and reassembly		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage (out-of-flat)		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting and measuring cylinder walls/sleeves for damage, wear, and ridges		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

Demonstrate an understanding of deglazing and cleaning cylinder walls		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks, check oil passage condition, measure end play and journal wear, check crankshaft position sensor reluctor ring (where applicable)		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting main and connecting rod bearings for damage and wear		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of identifying piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting and measuring piston skirts and ring lands		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of determining piston-to-bore clearance		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting, measuring, and installing piston rings		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of removing, inspecting or replacing crankshaft vibration damper (harmonic balancer)	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

Demonstrate an understanding of verifying correct camshaft timing	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of assembling an engine block		Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

D. Lubrication and Cooling Systems Diagnosis and Repair		
Demonstrate an understanding of inspecting, replacing, and adjusting drive belts, tensioners, and pulleys; checking pulley and belt alignment	P-1	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate understanding of inspecting, removing, and replacing water pump	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests
Demonstrate an understanding of inspecting, removing and replacing water pump	P-2	Classroom Discussion Lecture Classroom Exercises Reading Assignments Tests

III. OUTLINE OF TOPICS

A. Locate Vehicle Information

1. Locate vehicle history in Mitchell Management system
2. Locate correct vehicle information using Mitchell Pro Demand or Alldata
3. Locate technical service bulletins using Mitchell Pro Demand or Alldata
4. Locate vehicle service precautions using Mitchell Pro Demand or Alldata

B. Engine Theory
   1. Describe the four stroke internal combustion engine
   2. Properly identify engine components
   3. Describe airflow through the engine from intake systems to exhaust systems
   4. Explain the theory behind each engine component
   5. Explain how to remove and inspect/measure each component for wear
   6. Describe horsepower, natural aspiration and turbo/supercharging

C. Cylinder Head and Valve Train
   1. Describe cylinder head removal and inspection procedures
   2. Identify valve train components and discuss the function of each component
   3. Describe the different types of camshaft drives and the inspection procedures
   4. Properly discuss valve train adjustment procedure

D. Engine Assembly
   1. Explain how to install engine crankshaft and crankshaft vibration damper
   2. Describe the process for cylinder head installation
   3. Describe the process for intake and exhaust manifold installation
   4. Explain how to identify camshaft drive components and installation of the camshaft drive
   5. Explain how to install spark plugs and install engine accessories

IV. METHOD(S) OF INSTRUCTION

A. Lectures

B. Textbook Assignments

C. Classroom Assignments

D. Classroom Discussions

E. Small Group Projects

V. REQUIRED TEXTBOOK(S)

James D. Halderman, *Automotive Engines, Theory and Servicing* (current edition), Pearson

VI. REQUIRED MATERIALS

A. Jefferson College Automotive Technology Shirt (2)

B. Safety Glasses (Clear)

C. Shop Boots (Steel Toe Preferred)

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHOD OF EVALUATION

A. Tests 50%

B. Homework Assignments 50%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website http://www.jeffco.edu).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.