Las Positas College
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Course Outline for AUTO 72A

POWERTRAINS: ENGINES AND TRANS

Effective: Fall 2009

I. CATALOG DESCRIPTION:
AUTO 72A — POWERTRAINS: ENGINES AND TRANS — 4.00 units

Part one of an in depth study of engine, transmission, rear axle, front axle, and transfer cases: mechanical, measurement, and assembly. An in-depth study of the above mentioned components including theory, teardown, evaluate, qualifying, and rebuilding. This class' emphasis is on engines and transmissions. Students are encouraged to enroll in Automotive Lab concurrently. Prerequisite: Automotive Technology 55 (completed with a grade of "C" or higher).

3.00 Units Lecture 1.00 Units Lab

Prerequisite
AUTO INTR - Automotive Service and Introduction
with a minimum grade of C

Grading Methods:
Letter or P/NP

Discipline:

	MIN
Lecture Hours:	54.00
Lab Hours:	54.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 4

III. PREREQUISITE AND/OR ADVISORY SKILLS:
Before entering the course a student should be able to:

A. AUTOINTR

IV. MEASURABLE OBJECTIVES:
Upon completion of this course, the student should be able to:

A. Demonstrate the basic safety procedures of handling hazardous waste materials.
B. Explain the history of powertrain evolution.
C. Operate a wide variety of precision measurement equipment.
D. Explain four cycle engine theory and identify key components involved.
E. Teardown typical engine assembly.
F. Take measurements of engine components and compare to specifications.
G. Qualify new and used engine components.
H. Rebuild engine to manufacturer specifications.
I. Explain transmission gear ratio and hydraulic theory.
J. Teardown typical transmission assembly.
K. Take measurements of transmission components and compare to specifications.
L. Qualify new and used transmission components
M. Rebuild transmission to manufacturer specifications.
N. Maintain a clean and professional environment.

V. CONTENT:
A. Safety
1. Tool usage and nomenclature
2. Proper disposal procedures
3. Environmentally conscious decisions
B. Powertrain evolution
1. The first four cycle engines
2. Current engines
3. Horsepower and emission trade offs
4. Environmental decisions driving design
5. The first automatic transmissions
6. Current automatic transmissions

a. More gear ratios
b. Different fluids
c. Internal design improvements

C. Measurement tools
1. Micrometer
a. Vernier
b. Caliper
2. Dial bore gauge
3. Snap gauges
4. Straight edge
5. Feeler gauges
6. Hole gauges

D. Four cycle engine theory
1. Intake, compression, power, exhaust
a. 360 degrees in one degree intervals
b. Valve overlap
c. Timing concerns and tricks
d. Street vs. racing
2. DOHV vs. OHV vs. Valve in block design
a. Pros and cons of each
b. Current technology
3. Key Valve train components
4. Key bottom end components
5. Camshaft timing
a. Static camshaft
b. Dynamic camshaft
c. Electronic valves
6. Crankshaft design and balance
7. Cylinder head design
a. Single valve
b. Multiple valve

E. Engine Teardown
1. Removal and identification of external components
a. Special procedures
1. Loosening sequence
2. Removal and identification of internal components
a. Special Procedures
1. Loosening sequence

F. Component measurement
1. Specification lookup
2. Comparison
a. Component diagnosis
1. Failure analysis

G. Evaluation of replacement components
1. Correct component?
2. New and used part comparison

H. Engine rebuilding
1. Manufacturer Procedures
a. Component sequence
b. Torque specifications
c. Tightening sequences
d. Special concerns
1. Assembly lube
2. Gaskets and sealers
2. Dynamic engine torque
3. Proper engine timing
a. Camshaft to crankshaft
b. Crankshaft to balanceshaft

I. Automatic Transmission Theory
1. Gear Ratios
a. Shift Points
b. Planetary gear sets
c. Valves
d. Clutches
e. Sprags
2. Hydraulics
a. Basic and advanced hydraulics
b. Hydraulic control components
c. Fluid pressures
1. Line
2. Apply
3. Release
4. Clutch
5. Accumulator
6. Torque
7. Servo
8. D4, D3, D2, D1
3. Other Components
a. Final Drives
b. Torque converters
c. Apply systems
d. Differential components
e. Electrical components
1. TCM, THECM, PCM
2. Fluid temperature sensor
3. TISS and TOSS
4. TCC
5. PRNDL

J. Transmission Teardown
1. Removal and identification of FWD

a. Special procedures
2. Removal and identification of RWD
a. Special procedures

K. Component measurement
1. Specification lookup
2. Comparison
a. Component diagnosis
1. Failure analysis

L. . Qualification of replacement components
1. Correct component?
2. New and used part comparison

M. Transmission rebuilding
1. Manufacturer Procedures
a. Component sequence
b. Torque specifications
c. Tightening sequences
d. Special concerns
2. Assembly lube
3. Gaskets and sealers

N. Professionalism
1. Safety glasses
2. Working shop expectations
3. Attitude
4. Cleanliness
5. Maintenance of work areas and tools

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. **Demonstration** -
C. **Guest Lecturers** -
D. **Lab** - Group and individual laboratory activities
E. **Student Presentations** -
F. **Discussion** -

VII. TYPICAL ASSIGNMENTS:
1. Students are to complete section questions and exercises 2. Students must demonstrate ability to evaluate disassemble measure and reassemble engine, transmissions and transaxle units.

VIII. EVALUATION:
A. **Methods**

1. Exams/Tests
2. Quizzes
3. Lab Activities

B. **Frequency**

IX. TYPICAL TEXTS:
1. Jeffrey J. Rehkopf, *Automotive Engine Repair and Rebuilding.*, Prentice Hall, 2007.
2. Tom Birch, *1. Automatic Transmissions and Transaxles.*, Prentice Hall, 2007.
3. Safety glasses,
4. . closed toe shoes
5. shop/safety clothing

X. OTHER MATERIALS REQUIRED OF STUDENTS: