

Course Outline for AUTO P1

POWERTRAINS: MODIFICATIONS FOR PERFORMANCE

Effective: Fall 2019

I. CATALOG DESCRIPTION:

AUTO P1 — POWERTRAINS: MODIFICATIONS FOR PERFORMANCE — 4.00 units

An in-depth study of engine and transmission modifications made in order to improve performance. This class will explain the differences in laws governing vehicles in all fifty states including those registered in California; how to improve performance legally; and the penalties of breaking the law. Students will learn to calculate the benefit versus cost of bolt-on performance products and major engine or transmission modifications. NOTE: Some modifications are intended for off-road applications only. Students are encouraged to enroll in Automotive Lab concurrently.

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:

- Automotive Technology

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

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. AUTOINTR

1. utilize and apply hazardous waste handling;
2. identify and describe uses of automotive related tools;
3. describe the importance of preventative maintenance and inspection procedures as they relate to the automobile;
4. discuss four stroke engine cycle and identify engine parts;
5. perform basic engine teardown and reassembly;
6. apply Ohm's law, read basic schematics, test automotive electrical systems;
7. identify emissions components, understand 5 gas theory;
8. discuss braking systems, perform a brake inspection, identify parts;
9. differentiate between suspension and steering system types, inspect and qualify components;
10. identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

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. Operate a wide variety of precision measurement equipment.
- C. Explain four cycle engine theory and identify key components involved.
- D. Teardown typical engine assembly.
- E. Make measurements of engine components and compare to specifications.
- F. Explain the difference between 49 and 50 state legal.
- G. Interpret the Law as it applies to a personal vehicle and modification.
- H. Theorize possible horsepower outcomes for modifications.
 - I. Compare and Contrast Bolt-on Modifications.
 - J. Perform Major Powertrain Modifications.
- K. Demonstrate Professionalism.

V. CONTENT:

- A. Safety
 - 1. Tool usage and nomenclature
 - 2. Proper disposal procedures
 - 3. Environmentally conscious decisions
- B. Measurement tools
 - 1. Micrometer
 - a. Vernier
 - b. Caliper
 - 2. Dial bore gauge
 - 3. Snap gauges
 - 4. Straight edge
 - 5. Feeler gauges
 - 6. Hole gauges
- C. 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
- D. Engine Teardown
 - 1. Removal and identification of external components
 - a. Special procedures
 - b. Loosening sequence
 - 2. Removal and identification of internal components
 - a. Special Procedures
 - 1. Loosening sequence
- E. Component measurement
 - 1. Specification lookup
 - 2. Comparison
 - a. Component diagnosis
 - 1. Failure analysis
- F. Modification Laws
 - 1. Federal Standards
 - 2. California Standards
- G. Federal and California Statues regarding punishment
 - 1. Fines and Jail time
 - 2. Environmental impact
- H. Horsepower and Torque
 - 1. Horse Power calculations
 - a. Curve Maps
 - b. Slope versus Incline
 - 2. Torque Calculations
 - a. Curve Maps
 - b. Slope versus Incline
 - 3. Changes from modifications
- I. Bolt on Modifications
 - 1. Removal and identification of factory parts
 - a. Special procedures
 - b. Specific design flaws and challenges
 - 2. Installation and identification of modification parts
 - a. Special procedures
 - b. Specific design and challenges
- J. Major Powertrain modifications
 - 1. Cost versus gain
 - 2. Comparison
 - a. Component diagnosis
 - b. Manufacturing Process
- K. Professionalism
 - 1. Safety glasses
 - 2. Working shop expectations
 - 3. Attitude
 - 4. Cleanliness
 - 5. Maintenance of work areas and tools

VI. LAB CONTENT:

- A. Measurement tools
 - 1. Hands on use of all measurement tools in course content
- B. Engine Teardown and rebuilding
- C. Horsepower and Torque Measurement with Dynamometer
- D. Bolt on Modifications
- E. Major Powertrain modifications lab performance
- F. Professionalism
 - 1. Safety glasses
 - 2. Working shop expectations
 - 3. Attitude
 - 4. Cleanliness

5. Maintenance of work areas and tools

VII. METHODS OF INSTRUCTION:

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

VIII. TYPICAL ASSIGNMENTS:

- A. Lecture based assignments
 - 1. Lecture on State of California Smog laws regarding modifications
- B. Text based assignments
 - 1. Read Chapter One
- C. Current event based assignments
 - 1. The BAR just passed a ruling pertaining to (example). Discuss in class how this effects performance modifications
- D. Lab Based assignments
 - 1. Dyno test for HP and torque for baseline readings

IX. EVALUATION:

Methods/Frequency

- A. Exams/Tests
 - twice a semester
- B. Quizzes
 - Weekly
- C. Lab Activities
 - Daily

X. TYPICAL TEXTS:

- 1. ISBN-13: 978-1932494426. *Engine Management: Advanced Tuning* . 1 ed., Cartech, 2018.
- 2. ISBN-13: 978-1557884886. *Street TurbochargingHP1488: Design, Fabrication, Installation, and Tuning of....* 1 ed., HPBooks, 2017.
- 3. Alldata. Alldata, (Current/Online).
- 4. Shopkeypro. Snapon, (Current/Online).

XI. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. 1. Closed Toes Shoes.
- B. 2. Safety Glasses