

Las Positas College  
3000 Campus Hill Drive  
Livermore, CA 94551-7650  
(925) 424-1000  
(925) 443-0742 (Fax)

**Course Outline for AUTO 72B**  
**POWERTRAINS TRANS CASES/ AXLES**  
**Effective: Fall 2009**

**I. CATALOG DESCRIPTION:**

AUTO 72B — POWERTRAINS TRANS CASES/ AXLES — 4.00 units

Part two 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, qualifying, and rebuilding. Class emphasis is on rear axles, front axles and transfer cases. 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:**

	<b>MIN</b>
<b>Lecture Hours:</b>	54.00
<b>Lab Hours:</b>	54.00
<b>Total Hours:</b>	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 rear axle gear theory;
- E. Teardown typical rear axle assembly;
- F. Make measurements of rear axle components and compare to specifications;
- G. Qualify new and used rear axle components.
- H. Properly rebuild rear axle to manufacturer specifications;
- I. Explain front axle gear theory;
- J. Teardown typical front axle assembly;
- K. . Make measurements of front axle components and compare to specifications;
- L. Qualify new and used rear axle components.
- M. Properly rebuild front axle to manufacturer specifications;
- N. Explain transfer case gear and power flow theory;
- O. Tear down typical transfer case assembly;
- P. Make measurements of transfer case components and compare to specifications;
- Q. Qualify new and used rear axle components.
- R. Properly rebuild transfer case to manufacturer specifications;
- S. 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 axle assemblies

- 2. Current axle assemblies
    - a. Internal design improvements
  - 3. Environmental decisions driving design
- 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. Rear Axle theory
  - 1. Gear Design
    - a. Straight Cut
    - b. Hypoid Cut
    - c. Diagonal Cut
    - d. Street vs. racing
  - 2. Pinion Design
  - 3. Ring Gear Design
  - 4. Locking/Non-Locking Design
  - 5. Full/Free Floating Design
- E. Rear Axle 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. Rear Axle rebuilding
  - 1. Manufacturer Procedures
    - a. Component sequence
    - b. Torque specifications
    - c. Tightening sequences
    - d. Special concerns
      - a.
        - 1. Assembly lube
        - 2. Gaskets and sealers
  - 2. Pinion Depth setting
  - 3. Backlash setting
  - 4. Rotational toque
- I. Front Axle theory
  - 1. Gear Design
    - a. Straight Cut
    - b. Hypoid Cut
    - c. Diagonal Cut
    - d. Street vs. racing
  - 2. Pinion Design
  - 3. Ring Gear Design
  - 4. Locking/Non-Locking Design
- J. Front Axle 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
- K. Component measurement
  - 1. Specification lookup
  - 2. Comparison
    - a. Component diagnosis
      - 1. Failure analysis
- L. Evaluation of replacement components
  - 1. Correct component?
  - 2. New and used part comparison
- M. Front Axle rebuilding
  - 1. Manufacturer Procedures
    - a. Component sequence
    - b. Torque specifications
    - c. Tightening sequences
    - d. Special concerns
      - 1. Assembly lube
      - 2. Gaskets and sealers
  - 2. Pinion Depth setting
  - 3. Backlash setting
  - 4. Rotational toque
- N. Transfer Case theory
  - 1. Gear Design
    - a. Straight Cut
    - b. Hypoid Cut
    - c. Diagonal Cut
    - d. Street vs. Off Road

- 2. Drive Chain Design
- 3. Active/Passive Design
- 4. 4wd Hi/4WD Lo Design and usage
- O. Transfer case 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
- P. Component measurement
  - 1. Specification lookup
  - 2. Comparison
    - a. Component diagnosis
      - 1. Failure analysis
- Q. Evaluation of replacement components
  - 1. Correct component?
  - 2. New and used part comparison
- R. Transfer case rebuilding
  - 1. Manufacturer Procedures
    - a. Component sequence
    - b. Torque specifications
    - c. Tightening sequences
    - d. Special concerns
      - 1. Assembly lube
  - 2. Gaskets and sealers
- S. 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 transfer cases, front and rear axle units.

#### VIII. EVALUATION:

- A. **Methods**
  - 1. Exams/Tests
  - 2. Quizzes
  - 3. Lab Activities
- B. **Frequency**

#### IX. TYPICAL TEXTS:

1. Thomas S. Birch Charles Rockwood, *Manual Drivetrains and Axles*, ., Prentice Hall, 2007.
2. John F. Kershaw. *Manual Drivetrains and Axles*., Prentice Hall, 2007.
3. Safety glasses,
4. closed toe shoes
5. shop/safety clothing

#### X. OTHER MATERIALS REQUIRED OF STUDENTS: