

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Automotive Technology 132L – Differential and 4WD Systems Laboratory

3 hours laboratory, 1 unit

Catalog Description

This laboratory course describes and demonstrates proper operation, disassembly, assembly, repair, and diagnostic techniques for various differentials, transfer cases, and axles of standard and 4WD, and all-wheel drive systems types and designs, including electronic shift and hub locking. This course is the lab for students taking courses AUTO 132 Lecture, AUTO 132T Assessment Test Out, and/or for students taking Work Experience who need additional instruction and practice completing required ASE competencies and tasks.

Prerequisite

None

Course Content

- 1) Lecture:
 - a. Introduction and safety
 - b. Equipment operation
 - c. Basic hydraulic theory
 - d. Basic laws of physics as related to automotive differential systems
 - e. 4WD system theory of operation
 - f. Clutch systems theory of operation
 - g. Theory of operation of electronic and mechanical gear shifting systems
 - h. Torque multiplication theory and design as it relates to drivetrain performance
 - i. Tire and wheel design effect on drivetrain performance
 - j. Various differential and axle servicing procedures using special tools
 - k. 4WD hydraulic locking systems and service procedures using pressure and vacuum
 - l. Differential and 4WD component description and operation
 - m. All wheel drive systems
 - n. Locking hubs

Course Objectives

Students will be able to:

- 1) Demonstrate standardized safety and hazardous waste handling practices.
- 2) Apply gear mechanism system theory principles in order to diagnose and repair differential systems and related problems.
- 3) Diagnose and repair various differential and 4WD systems.
- 4) Demonstrate electronic diagnosis and repair of computer-controlled transfer case clutch systems.
- 5) Demonstrate electronic diagnosis and repair of computer-controlled and mechanical differential systems.
- 6) Utilize manufacturer's repair information and technical service bulletins for accurate diagnosis and repair of differential and 4WD systems.
- 7) Diagnose and repair vacuum controlled locking hub systems.

Method of Evaluation

A grading system will be established. Grades determined by summative test proficiency in the subject matter using multiple measurements, one of which is a demonstration of the components related to the cause of failure using the diagnostic processes and skills demonstrations of corrections.

- 1) Skills-based summative assessment that measures students' ability to complete the required ASE tasks related foundational knowledge of diagnosis, replacement, repair, and testing of automotive differentials and 4WD systems.
- 2) Practical exercises that measure students' progress toward mastering tasks related to replacement, repair, diagnosis, memorization of components for testing of differentials and 4WD systems.
- 3) A student portfolio is required to showcase student comprehension.
- 4) Performance projects used to evaluate student ability to accurately perform repair procedures using web conferencing and simulations.

Special Materials Required of Student

- 1) Mechanic's hand tool set
- 2) Approved safety glasses and dress code
- 3) Must have access to high speed internet
- 4) A large screen tablet or computer.

Minimum Instructional Facilities

- 1) Auto tech lab (20 bays)
- 2) Various training vehicles
- 3) Smart classroom
- 4) Distance education technologies

Method of Instruction

- 1) Lecture and demonstration are both synchronous and asynchronous. Students are required to attend all lectures and participate with the instructor and other students during live lectures. Students will have access to recorded lectures.
- 2) Individual assistance by file sharing, computer sharing, live demonstration of project based methods for diagnosing and repairing vehicles.
- 3) Discussion boards will be used to assign weekly reflections and posting of student assignments.
- 4) Demonstrations and vehicle repair processes will be broadcast as group assignments.
- 5) Remote assistance where a student controls the computer system from a distance.

Out-of-Class Assignments

- 1) **Reading:** assigned course materials, manuals, content on websites, and more.
- 2) **Writing:** assignments where students describe the required tasks related to diagnosis, replacement, repair, and testing of differentials and 4WD systems and components, and more
- 3) **Other:** web-based training modules, portfolio performance projects related to differentials and 4WD systems and components, and more.

Texts and References

- 1) Required (representative examples):
 - a. Student workbooks – will be provided electronically.
 - b. Required: VanGelder, Kirk. Fundamentals of Automotive Technology. Jones and Bartlett Learning, 2023.
 - c. Web Based Training Modules will be provided electronically.
 - d. Workshop Manuals will be provided electronically.
- 2) Supplemental: None

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Accurately demonstrate repair of various 4WD and differential system conditions.
- 2) Resolve 4WD and differential problems by navigating the workshop manual based on symptoms and making correct actions.
- 3) Communicate effectively and professionally in a diverse setting that includes prospective colleagues, clients, and supervisors.
- 4) Comply with environmental health and safety regulations at the state and federal levels.