

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Automotive Technology 132 – Differential and 4WD Systems Diagnosis and Service

1 hour lecture, 1 unit

Catalog Description

This lecture course includes a detailed study of modern automotive electronic or manually controlled differential and 4WD systems and service procedures. The course will describe systems inspection, adjustment and repair procedures, including methods of diagnosing and repairing various mechanical and hydraulic drivetrain systems using specified tools and procedures. This course is accompanied by AUTO 132L Differential and 4WD Systems Diagnosis and Service Laboratory, AUTO 132T Assessment Test Out, and Work Experience courses where students will perform specific ASE competencies related to differential and 4WD diagnosis and repair.

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

Course Objectives

Students will be able to:

- 1) Describe standardized safety and hazardous waste handling practices.
- 2) Apply gear mechanism system theory principles in order to describe differential systems and related problems.
- 3) Identify various differential and 4WD systems.
- 4) Describe electronic diagnosis and repair of computer-controlled transfer case clutch systems accurately.
- 5) Describe 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) Identify vacuum controlled locking hub systems for normal operation.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on foundational proficiency in subject matter determined by multiple measurements for

evaluation, one of which must be essay exams, simulations, and web based training modules using distance education technologies, performance projects where a student is required to submit assigned artifact examples of specific competencies using a portfolio.

- 1) Quizzes, written exams, and hands-on performance exam that measure students' ability to safely identify necessary action or repair using distance education methodologies.
- 2) Practical exercises that measure students' progress toward mastering tasks related to diagnosis, replacement, repair, testing, of differential and 4WD systems and components.
- 3) Skills-based summative assessment that measures students' ability to successfully complete the necessary ASE tasks related to diagnosis, replacement, repair, and testing of the related drive train components, by completing required specific tasks in the student's portfolio.
- 4) Students must complete all of the required web based training modules.

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 projects-based methods for diagnosing and repairing vehicles.
- 3) Discussion boards will be used to assign weekly reflections and posting of student assignments.
- 4) Classroom Management System (CMI) 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 describe various 4WD and differential system conditions.
- 2) Identify 4WD and differential problems by navigating the workshop manual based on symptoms.

- 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.