

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Automotive Technology 132T – Differential and 4WD Systems Assessment Test Out

1.5 hours laboratory, .5 units

Catalog Description

This assessment course includes summative and criterion tests using actual differential and 4WD repair techniques. This course allows a student to demonstrate knowledge of proper operation, disassembly, assembly, repair; and diagnostic techniques for various differentials, axles, 4WD, All-Wheel drive types and designs including electronic controls in the department laboratory or by using distance education technologies, live demonstrations, and recordings of work. The assessments will include various tests using differentials and transfer cases, gears, assemblies, and vehicle symptoms and conditions. This course allows a student residing at a distance from training centers to complete manufacturers certification requirements. This course accompanies AUTO 132L Differential and 4WD Systems Lab, 132 Lecture, and Work Experience classes.

Prerequisite

None

Recommended Preparation

“C” grade or higher or “Pass” in AUTO 162T Electronics Diagnosis and Repair Assessment Test Out.

Entrance Skills

Without the following skills, competencies, and knowledge, students entering this course will be highly unlikely to succeed:

- 1) Demonstrate computer input and output tests and activation using a scan tool
- 2) Obtain and describe normal and abnormal waveforms using a lab-scope
- 3) Test thermistor, potentiometer, variable reluctance, pressure, Hall-effect and related sensors
- 4) Graph and interpret system data using PIDS on a scan tool
- 5) Diagnose and repair computer communication networking faults
- 6) Describe types and functions of computer memory including RAM, ROM, and PROM
- 7) Demonstrate proper diagnosis and repair of electronic system concerns

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) Describe and 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, describe, and repair various differential and 4WD systems.
- 4) Demonstrate and describe electronic diagnosis and repair of computer-controlled transfer case 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 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 formative assessments. Students will have access to recorded tests.
- 2) Individual assistance by file sharing, computer sharing, live demonstration of project based methods for diagnosing and repairing vehicles.
- 3) 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 (pass online pretests prior to laboratory "Test Out"), 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, describe, and repair various 4WD and differential system conditions.
- 2) Resolve 4WD and differential problems by navigating the workshop manual based on symptoms and taking corrective 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.