

COURSE OUTLINE
Revision: Doug Clapper-2012

DEPARTMENT:	Automotive Diesel Technology
CURRICULUM:	Diesel and Heavy Duty Equipment Technology
COURSE TITLE:	Drive Train
COURSE NUMBER:	HDM 127
TYPE OF COURSE:	Vocational Preparatory
COURSE LENGTH:	130 Hours
CREDIT HOURS:	8
LECTURE HOURS:	30
LAB HOURS:	100
CLASS SIZE:	20
PREREQUISITES:	HDM 101 (Introduction to Heavy Duty) or Instructor's Permission

COURSE DESCRIPTION:

Course covers diagnosis and repair of Drive Train components, including mechanical clutches, flywheels, standard transmissions, torque converters, and automatic/power shift transmissions. Students will learn how to troubleshoot, diagnose, disassemble, and reassemble transmissions common to the industry. Students will also learn how to check universal joints; drivelines, differential assemblies, and final drive units. Course includes instruction in safety, environmental awareness, human relations, and leadership.

STUDENT LEARNING OUTCOMES ADDRESSED:

1. Personal Responsibility - Demonstrate safety in use of all equipment and tools. Practice environmental regulations.

2. Critical Thinking and Problem Solving - Diagnose Drive Train problems.
3. Technology - Use appropriate technological tools and equipment.
4. Computation - Correctly compute gear ratios and accurately measure driveline angles.
5. Information Literacy - Use manufacturer's manual for specifications.
6. Complete the attached NATEF Task List

GENERAL COURSE OBJECTIVES:

At the end of the course the student will possess the following skills or have knowledge in the following areas:

CLUTCHES

- Understand the operation of a clutch
- List the components of a clutch
- Describe how manual and self-adjusting clutches are adjusted
- Describe the function of a clutch brake
- Troubleshoot a clutch for wear and damage
- Outline the procedure for removing and replacing a clutch

STANDARD TRANSMISSIONS

- Identify and describe the gear designs used in heavy-duty truck transmissions and components
- Define and calculate gear ratios
- Identify the major parts of a typical transmission
- Explain the role of main and auxiliary gear sections in a transmission
- Describe the operating principles of range and splitter transmissions

STANDARD TRANSMISSION SERVICING

- Explain the importance of using the correct lubricant and maintaining the correct oil level in a transmission
- Describe a procedure for troubleshooting a transmission
- Identify causes of various transmission performance problems
- Analyze transmission parts for wear and damage and pinpoint the cause
- Troubleshoot an air shift system

TORQUE CONVERTERS

- Explain the function of the torque converter in a vehicle equipped with an automatic transmission
- Define torque multiplication and explain how it is generated in the torque converter
- Explain the overrunning clutch, lockup clutch, and variable pitch stators
- List the basic torque converter service and maintenance checks

AUTOMATIC TRANSMISSIONS

- Name the three parts of a simple planetary gear set and explain the basic operating principle

- Describe a multiple disc clutch and explain its role in the operation of an automatic transmission
- Describe the hydraulic circuits and flows used to control automatic transmission operation

AUTOMATIC TRANSMISSION MAINTENANCE

- Name the types of hydraulic fluid suitable for use in heavy-duty truck transmissions
- Safely perform a transmission stall test
- Perform engine speed and vehicle speed shift point tests

DRIVE SHAFTS

- Name the parts of a drive line
- Explain the procedure for inspecting, lubricating, and replacing a universal joint
- Describe the types of wear a universal joint might experience
- Explain the importance of working angles and how to check them
- Outline the procedure for identifying the source of drive line vibration

HEAVY-DUTY TRUCK AXLES

- Identify the variety of axles in use on heavy-duty trucks
- Name the basic parts of the drive axles and explain how they work
- Explain the purpose of a power divider or interaxle differential

TOPICAL OUTLINE:	APPROX. HOURS
I Overview of course and procedures	
II CLUTCHES	14
A Clutch function	
B Basic Clutch Components	
C Clutch Failure analysis	
D Periodic Maintenance	
E Troubleshooting	
F Clutch Servicing	
III STANDARD TRANSMISSIONS	18
A Main and Auxiliary Gearing	
B Countershaft Transmissions	
C Mechanical Shift Mechanisms	
D Transfer Cases	
E Power Takeoff Unit	
IV STANDARD TRANSMISSION SERVICING	18
A Lubrication	
B Preventive Maintenance Inspections	
C Troubleshooting	
D Removing the Transmission	
E Troubleshooting the Air Shift System	
V TORQUE CONVERTERS	15
A Design	

B Basic Operation	
C Maintenance and Service	
VI AUTOMATIC TRANSMISSIONS	15
A Simple Planetary Gear Sets	
B Transmission Hydraulic Systems	
VII AUTOMATIC TRANSMISSION MAINTENANCE	15
A Inspection and Care	
B Shift Point Adjustment	
C Troubleshooting	
VIII DRIVE SHAFTS	15
A Construction	
B Drive Line Arrangements	
C Drive Shaft Inspection	
D Universal Joint Working Angles	
E Drive Shaft Phasing	
F Lubrication	
G Chassis Vibration Diagnosis	
IX AXLES	20
A Types	
B Lubrication	
C Truck Axle Servicing	
D Drive Axle Failure Analysis/Diagnostics	
Total	130

Program Outcomes

1. Identify function, read diagrams and manufacturer specifications, inspect, diagnose problems, replace/repair, and service all major components of heavy duty equipment and vehicles. (SLO 1.1 & 7.2)
2. Using IVISDS sheets, OSHA and WISHA standards, demonstrate safety procedures relating to equipment, personal safety, and safety of others. (SLO 6.4)
3. Demonstrate proficiency in using hand and electronic testing and repair equipment. (SLO 6.3)
4. Consistently apply standards and guidelines for safe work procedures. (SLO 6.4 & 6.5)
5. Work independently and in groups to service, complete repairs, test, and maintain heavy duty vehicles to meet industry standards. (SLO 3.1)

6. Use industry tools to measure service. (SLO 2.2)
7. Use technology to test and repair equipment. (SLO 5.1)
8. Identify and strategize own career plans within the field. (SLO 6.2)
9. Practice good customer service. (SLO 3.2)
10. Work with accuracy, dependability, proficiency and speed when servicing equipment. (SLO 6.1)
11. Explain the expectations of employers for employees within the diesel industry. (SLO 7.1)
12. Communicate and document service records. (SLO 1.2)
13. Demonstrate basic competency in use of computers to access repair/replacement data and to document service. (SLO 5.1 & 7.1)

Student Learning Outcomes (SLO)

STUDENT LEARNING OUTCOMES are the knowledge and abilities every student graduating with a certificate or degree from South Seattle Community College will have. Students will achieve these outcomes as well as the specific curriculum outcomes for their academic or technical area of study.

1. Communication

- 1.1 Read and listen actively to learn and communicate.
- 1.2 Speak and write effectively for personal, academic and career purposes.

2. Computation

- 2.1 Use arithmetic and other basic mathematical operations as required by program of study.
- 2.2 Apply quantitative skills for personal, academic, and career purposes.
- 2.3 Identify, interpret and utilize higher level mathematical and cognitive skills (for those students who choose to move beyond the minimum requirements are stated above).

3. Human Relations

- 3.1 Use social interactive skills to work in groups effectively.
- 3.2 Recognize the diversity of cultural influences and values.

4. Critical Thinking and Problem-Solving

- 4.1 Think critically in evaluating information, solving problems and making decisions.

5. Technology

5.1 Select and use appropriate technological tools for personal, academic and career tasks.

6. Personal Responsibility

6.1 Be motivated and able to continue learning and adapt to change.

6.2 Value one's own skills, abilities, ideas and art.

6.3 Manage personal health and safety.

6.4 Be aware of civic and environmental issues.

7. Information Literacy

7.1 Access and evaluate information from a variety of sources and contexts, including technology.

7.2 Use information to achieve personal, academic, and career goals, as well as to participate in a democratic society.

REVISED BY: Doug Clapper
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