

College of Agriculture and Applied Sciences  
School of Applied Sciences, Technology and Education (ASTE)  
Utah State University Eastern  
Assessment Plan  
*For the Undergraduate Program in  
Diesel Equipment Technology*

Fall 2017

## Department Profile

Diesel Equipment Technicians repair and maintain diesel engine powered equipment. The diesel equipment technology program at USU Eastern has been designed to prepare a student for a career in either "on highway" or "off road" industry by offering theory and hands on instruction related to the common sub-systems used in both equipment areas. By taking a broad spectrum of classes, a student is able to get a feel for the diesel industry. A student will also be able to focus on a particular emphasis, while the experience in various study areas provides for diversified employment opportunities upon completion. Authentic learning is incorporated into all courses as it becomes available and as it fits into the curriculum (see Appendix 4A)

Students get hands on opportunity to perform preventive maintenance, inspection, adjustments, and repair to air brakes, suspension systems, clutches, transmissions, differentials, and drive line components used in heavy duty diesel equipment. Once again live work is brought into the shop USUE has great industry support in this area because we have one of the few heavy truck alignment systems in Utah it is a Hunter computerized heavy duty alignment rack. Students do computerized front end and tandem alignment on medium and heavy duty trucks. Student Particular attention is given to attendance, quality of work, productivity during class time and the ability to follow detailed written procedures from service manuals. Shop safety is also stressed.

### Program Assessment

In the past 4 or 5 years different teaching strategies have been tried in the class room as well as the lab. Things like students giving a presentations works well on occasion and as a break from the normal, seems to take up a lot of time if used more than once or twice a semester.

Take home quiz's work well to get the students to study the book, but students tend to memorize the questions instead of learning to problem solve from the information provided in the book

The strategy that seems to work best is to lecture then do hands on that day in the lab then give pop quiz's to check learning, and finally test to finish the chapter.

Power point presentations can work really well but need to be a guide for the lecture not read to the students

Videos work well to reinforce after the fact of lecture not to replace lecture.

### Program Support

USU Eastern Diesel Technolgy has modern equipment in many areas it's a challenge to stay current in engines and electronics areas. These areas are rapidly changing in the industry and teaching equipment beomes out dated in just a few years. The cost of 1 diesel engine can be anywhere from \$10,000 for a light duty engine up to 30,000 for a heavy duty high speed truck engine. The elctronics diagnostics area is becoming expensive with licenes renewals as high as \$1800 per year

Summer conference have been helpful in staying current with the industry trends. Working as a diesel technician in the summer really helps to stay current, Funding has been offered by USU

to get outside training and is currently in the process of deciding what training would be the best.

**Students**

- It is strongly recommended that a student have a minimum ACT score of 16 or higher in both Math & English. Students are required to follow detailed written procedures so good reading comprehension is essential.
- Class size is on average about 16 full time students (see Table 1 for enrollment)
- AAS degree in diesel technology or students can continue on for a AS degree
- Enrolment dropped when CEU was in transision of becoming USUE. Since then it has been up
- 80% of students who start the diesel program finish while only 60% actually will get the AAS degree
- Student placement rates is near 95% in entry level jobs paying \$15.00 to \$25.00 per hour

**Table 1: Secondary and post-secondary enrollment and completion**

	<b>Carbon</b>				Fiscal Year Total
	Post-Secondary		Secondary		
	Credit	Non Credit	Credit	Non Credit	
FY 11	22	17	3		42
Credit Total	25				
Non-Credit Total	17				
FY 12	25		4		29
Credit Total	29				
Non-Credit Total	0				
FY 13	14	25			39
Credit Total	14				
Non-Credit Total	25				

**Program Completion**

	FY14	FY15	FY16
Diesel Mechanics	5 (2 AAS)	7 (4 AAS)	11 (7 AAS)

**Program Placement**

	FY14	FY15	FY16
Diesel Mechanics	4	6	10

## APPENDX 4A

### Courses Offered

- **FALL Even Year; Diesel Engine Over Haul. 8 credits**

Student learn how disassemble engines, clean, measure tolerances down to .0001 of an inch calculate oil clearance on diesel engines. Students also learn what to measure and where to measure the machined surfaces of not only the engine block, but also all other parts of the diesel engine. Student s are then require to assemble the engine and test it on the engine Dynometer. The engine Dyno control is completely computerized and capable of 100HP and 2000ftlbs of torque we recently up dated the soft ware. The diesel department has 8 to 12 engines on hand for students to rebuild the cost to rebuild engines is high sometimes we can sell these engines and get others. The diesel department also brings in “live work”. Live works is the public having students rebuild light duty diesels, farm tractors and some heavy duty engines. This works out really well because the department doesn't have to buy parts and the owner gets an engine rebuilt and the students experience real world pressure. Students also learn how to machine the components of the engine USUE is one of only a few that actually teach engine machining. Engine Machining class is taken in the afternoon 2 days a week student learn how to bore cylinders , resize rods ,rebuild valve seats and guides, and grind the surface of the block and heads.
- **Spring Odd Year: Advanced Diesel Engines. 10 credits**

Students learn the theory and how to test and adjust all the sub-systems of the diesel engine including oil pressure, cooling intake, exhaust and most importantly the fuel system which is electronically managed. Getting the very latest diesel engines and equipment to test is a challenge to say the least. To do this we have fair support from the industry in supplying us with the software to communicate electronically with the engine or truck. The department spends around \$3000 a year to keep up with the latest technology out there to test and diagnose diesel equipment not only the engines but all the systems on mobile equipment are becoming computer controlled. USUE has a Trucking and Heavy Equipment program that we partner with to test live equipment in a real world setting. The diesel industry technology is advancing in leaps and bounds and is being driven by the need to clean up the air that we breathe as well as fuel mileage. The need to stay abreast of the current technology is a must not only as a technician but as an instructor as well.
- **Fall Odd Year; Mobile Electrical and Electronic 8 credits**

Students will study the basic principles of electricity including electron flow in series and parallel circuits, Ohm's law, magnetism and semiconductor devices related to the mobile industry. The theory and operation of a complete vehicle electrical system and its various components will be discussed in a series of sub-systems. These sub-systems include: the battery, starter and starting system, alternator and charging system, gauges and instrument panel, vehicle lighting and accessories, engine electronic sensors, as well as the wiring and connections used in each of these systems. Students have the opportunity to

learn schematic symbols by studying the various types of electrical circuits used in mobile equipment. Students will be introduced to different test instruments such as the digital multi-meter and testing techniques unique to each type of equipment will be presented. Hands-on experience and theory is given to the student. Each individual type of testing equipment is demonstrated as well as techniques given for troubleshooting, servicing and testing electrical systems: Students demonstrate their proficiency using this equipment to test batteries, starters and the starting system, the alternator and charging system, gauges, lights and accessories, engine sensors, as well as the wiring harness and connections used in each of these systems. Particular emphasis is placed on component identification, isolating component failures, and electrical safety procedures for both personal safety as well as preventing electrical system damage. Once again live work is brought into the shop. Students can fix lights test starting and charging systems and fix any problems in the electrical, electronic system

- **Fall Odd Year; Fluid Power 7 credits** Classroom instruction is given in the basic fundamental principles of fluid power. Students will discuss and mathematically calculate the relationships between hydraulic pressure, force, area, and resistance as well as rpm, torque, hydraulic horsepower, energy and heat loss. Covers the theory and operation of hydraulic fluid, reservoir design, filters, pumps, actuators, pressure controls, directional controls, and flow controls. Students will have the opportunity to learn schematic symbols through representations of various types of circuit design representing both closed loop and open center systems in industrial as well as mobile applications. Topics discussed will be pressure compensated systems, hydrostatic drive circuits and system troubleshooting. As the course progresses, students will be introduced to methods of troubleshooting hydraulic systems using a flow meter and pressure gauges. Students will also identify and review hydraulic fittings, hose types, and safety. Hands-on experience identifying, testing, troubleshooting, and rebuilding various brands of hydraulic components. Students will have the opportunity to use a flow meter and pressure gauges to troubleshoot hydraulic components as well as test different components on a hydraulic test bench. Particular emphasis is placed on component identification, failure analysis and hydraulic fitting identification. Once again live work is brought into the shop usually a backhoe works best. Students can test pressures and rebuild cylinders in a real world setting.
- **Spring Even Year Mobile Air conditioning 3 credits** Covers the principles of heat transfer using refrigerant as the medium. Particular attention is given to the identification and operation of individual system components as well as the variations in system design from OEM to OEM. Different types of refrigerants used in the mobile industry as well as recovery, recycling, storage, handling, and disposal will be discussed. Students are taught methods for R12 to R134A conversion. After EPA laws and guide lines have been taught students are given the hands-on opportunity to locate, identify, test, service, and troubleshoot different types of mobile AC systems using EPA approved equipment and procedures. They will demonstrate their proficiency using recovery recycling, evacuation, and charging equipment for both R-12 and R-134A refrigerants. System conversion from R-12 to R134A is also demonstrated. The student will have the opportunity to test for a MACS recovery and recycling certificate.

- **Spring Even Year Heavy Duty Chassis and Power Trains 10 credits**  
Covers highway truck air systems, foundation brake repair and maintenance, front end, tandem, and trailer axle alignment, heavy duty suspension systems, manual and automatic transmissions, clutches, differentials, and drive lines. Students will calculate drive line angles, gear ratios, and tire size, as well as troubleshoot and analyze tire wear, failures of gears, universal joints, clutches, axles, brakes