

Power Technology
University of Alaska Southeast
2019-2020 Annual Program Assessment Report

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Program Overview

The Power Technology Program at UAS provides students with the skills they need to find good paying jobs. The Power Technology programs are dedicated to providing quality learning opportunities in a supportive environment where power technology students can learn new skills or advance existing skill levels. The Power Technology department provides the knowledge, tools and experiences that enable students to develop professionally and experience personal growth and enrichment.

Program Student Learning Outcomes

- Comply with personal and environmental safety practices specific to the diesel industry.
- Evaluate and apply technical information and testing procedures from a variety of sources to troubleshoot diesel equipment.
- Maintain, diagnose, and repair the following systems: engine, electrical, hydraulic, refrigeration, drive train, brakes, steering/suspension, marine vessel components and AC power generation.
- Communicate and document work performed using trade specific language and digital images.
- Act responsibly and ethically as an employee by being punctual, adhering to company policies and interacting positively and appropriately with co-workers, supervisors and customers.
- Apply research techniques to identify emerging heavy equipment technologies.

Data Collection and Analysis

- In some Power Technology (PT) class's students take pre-course test. All PT classes end with a written final exam, some finals have a hands on activity or identification of parts and/or components included. Some classes have a final project. These methods assess learning outcomes. Analyses of outcomes are used to determine material that needs additional and or different coverage.
- Project work and lab assignments show tangible evidence of student understanding of lectures and demonstrations.
- Results of on-line course evaluations are reviewed and used to assess course strength and weaknesses.
- Professional advisory committees are consulted regularly for industry trends and work place skills expected of graduates of the programs.
- All PT courses are structured with a lecture and lab element. The time for each class session is divided approximately in half. So the average class meets twice a week for four hours for a total of 13 class sessions.
- **Lecture:**
 - Involves a PowerPoint or discussion with a training aid
 - Reading is assigned with homework based on the lecture
 - Parodic quizzes based on homework
 - Midterm based on quizzes

- Final based on midterm and quizzes and homework and lab assignments
- **Lab:**
 - Lab assignments and or projects are based on the lecture of that day
 - The homework then reinforces the hands on portion that was done in the lab.

Lecture Grade Rubric for All DESL Classes

A	B	C	D	F
Student has no unexcused absences or tardies. Demonstrates an excellent understanding of written and presented material.	Student has no unexcused absences up to 1 tardy. Demonstrates a good understanding of written and presented material	Student has up to 1 unexcused absence, up to 2 tardies. Demonstrates an average understanding of written and presented material	Student has up to 2 unexcused absences, up to 3 tardies, Demonstrates a poor understanding of written and presented material	Student has more than 2 unexcused absences, more than 3 tardies, Demonstrates no understanding of written and presented material Usually drops course

Lab Rubric for DESL S110 and S130 (most diesel classes)

What it takes to get a good lab grade. Ten (10) points possible

1-3 points

- Little or no advance preparation
- Lets others set and pursue the agenda
- Observes passively and says little or nothing
- Responds to questions if specifically asked
- Will do something if told exactly what to do
- On phone or taking breaks too often
- Stands around chatting (not about the project at hand)

4-7 points

- Moderately prepared in advance
- Takes some part in setting group goals and agendas
- Participates in discussions, letting others provide the direction
- Occasionally introduces information or asks questions
- Is willing to find resources that provide additional information (manuals, online)
- Capable and willing to do minimal reading in order to follow a procedure

8-10 points

- Well prepared in advance
- Takes a large part in setting group goals and agendas
- Actively participates in discussion and asks questions
- Listens actively and shows understanding
- Volunteers willingly and carries own share of groups responsibilities

- Willing to read and reread a manual to gain enough understanding to do procedure.
- Will help another group if has enough understanding to do so

Classes studied in this report to determine if Student Learning Outcomes (SLO) are being met

1. **DESL S110 Diesel Engines**
2. **DESL S130 Refrigeration and Air Conditioning**
3. **DESL S121 Basic Electrical**

1. DESL S110 Diesel Engines SLO

- Identify all major types diesel engines and how they operate, including on highway, off highway, equipment, and marine.
- Analyze the operation of various types of systems, such as cooling, lubrication, fuel, and air.
- Formulate proper repair criteria and procedures as stated in both hard copies of repair manuals and online software programs.
- Evaluate the safety factors and precautions needed when using lifting and jacking equipment, grinders (both bench and angle), hydraulic press work, torqueing, hammering, and prying
- Evaluate what troubleshooting steps are necessary to isolate a problem.
- Conclude and perform the most effective maintenance procedures for a specific system using service manuals and online software.

Engine Component Identification Pretest

Entering course skill level	Very Little Knowledge	Some Knowledge	Advanced Knowledge	Total Students
Number of students	4	8	2	14

Completely Dissembled Engines

The lab portion of this class involves a complete tear down of a diesel engine, identifying and measuring all parts for wear, then reassembly and starting the engine. Successful assembly of an engine directly relates to the students understanding of the various systems that make up a diesel engine (lecture) and how well the student can apply the information in the service manual to hands on procedures in order to reassemble the engine.

(NOTE) all engines were reassembled and ran at end of semester

The chart below shows a direct correlation between a student’s letter grade in lecture and how well they did on their lab project. In engines class the lab project lasts the entire semester.

Lab Project Posttest Grade Rubric

Engine run (posttest)	Engine ran after initial assembly with no instructor intervention	Engine needed minor troubleshooting to run Such as: injectors needed adjustment, fuel pump needed retimed	Engine needed instructor troubleshooting to run. Such as: cam timing was wrong, wrong sequence was used for adjusting valves and injectors. Internal components assembled wrong	Engine did not run
Number of engines	1	3	2	0
Student letter grade	A	B	C or D	F
Number of students	2	6	4	2

Recommendations for DESL S110:

More time was devoted in lecture to camshaft timing, fuel pump timing, valve and injector timing. It seemed to help, less engines needed to be troubleshooted by the instructor in order to get the engine running. It is an ongoing battle to get the students to understand and adhere to the service manual when reassembling their engines.

2. DESL S131 Refrigeration and Air Conditioning SLO

- Recognize air-conditioning and refrigeration components and their functions.
- Analyze the operation of various systems including: type I, type II, type III (stationary refrigeration systems) and automotive air conditioning systems.
- Check, test, and adjust refrigeration and air conditioning systems.
- Formulate proper repair criteria and procedures for most refrigeration and air conditioning systems.
- Evaluate the safety factors and precautions needed when working on systems that have refrigerant in them including but not limited to R-12, R-22, R-123, R-134.
- Evaluate what troubleshooting steps are necessary to isolate a problem in both stationary refrigeration systems and automotive air conditioning systems.
- Conclude and perform the most effective maintenance procedures both stationary refrigeration systems and automotive air conditioning systems.
- Handle and use refrigerants following EPA guidelines and laws.
- Students will be provided (included in class fees) with the opportunity to take the EPA 608 Core, type I, type II, type III or Universal test(s) and earn the certificate.

Refrigeration and Air Conditioning Pretest

Entering course skill level	Very Little Knowledge	Some Knowledge	Advanced Knowledge	Total Students
Number of students	10	3	0	13

The EPA 608 refrigeration test is divided up into four parts: the Core test which must be passed in order to earn any of the Type I, Type II, and Type III. If the Core and Type I, II, III are passed a Universal Type is earned.

Type of certificate earned	Core	Type I	Type II	Type III	Universal Type
Number of students	11	10	7	3	3

Grades Earned by Students in DESL S130

Student letter grade	A	B	C	D	F	Total students
Number of students	4	5	4	0	0	13 (2 dropped class)

The two charts above show that the students that did well in the lector and lab parts of DESL 130 also did well on the EPA exam.

Recommendations for DESL S130:

The feds changed the EPA test and study booklet at the end of 2019 so nationwide students had trouble studying for the EPA exam.

More vacuum pumps and gauges were purchased and this helped the students gain more hands on time in the lab.

3. DESL S121 Basic Electrical SLO

- Identify and interpret electrical/electronic system concern; determine necessary action.
- Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers.
- Diagnose electrical/electronic integrity of series, parallel, and series-parallel circuits using principles of electricity (Ohm's law).
- Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance.
- Check electrical circuits with a test light; determine necessary action.

- Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.
- Perform battery capacity test; confirm proper battery capacity for vehicle application, determine necessary action.
- Perform starting and charging system tests, diagnose and repair.

In DESL S121 one lab assignment dealing with starters and starting systems and the corresponding quiz will be documented.

Student letter grade for quiz # 10	A	B	C	D	F
Number of students	2	4	4	1	1

DESL S121 Lab Rubric

Student task performance is rated on a scale from 0 to 3.

In order to receive a rating of “3” on a task, the student must be able to demonstrate the following:

- Explain thoroughly the purpose and procedures involved with the task in question.
- Perform the task to completion while working independently.
- Comply with all applicable personal and environmental safety practices during performance of the task.

In order to receive a rating of “2” on a task, the student must be able to demonstrate the following:

- Be able to answer basic questions about the task as posed by the instructor.
- Perform the task to completion with limited prompting by the instructor.
- Comply with all applicable personal and environmental safety practices during performance of the task.

In order to receive a rating of “1” on a task, the student must be able to demonstrate the following:

- Perform the task to completion while relying on guidance from the instructor or a fellow student.
- Comply with all applicable personal and environmental safety practices during performance of the task.

A rating of “0” indicates the student has no knowledge of the task.

Student proficiency in lab assignment #28 “Cranking circuit voltage drop test”	“3”	“2”	“1”	“0”
Number of students	11	0	1	0

Grades Earned by Students in DESL S121

Student letter grade	A	B	C	D	F	Total students
Number of students	1	7	4	0	0	12

Recommendation for DESL S121: Quiz and especially lab scores for class # 9 curriculum were very good, This directly relates to class size (about 2/3 of last year) as well as over all grades for the semester were better.

Improvements and future plans for tracking student learning outcomes:

- Class sizes were down from the previous year and the students grades reflected this with higher scores being obtained.
- The Power Technology Program is continually working on acquiring new and more teaching aids. Students in all degree programs within Power Technology benefit from new technology acquired. The number of “like” training aids was not as important this year because of declined enrollment.
- An entrance exam for the Power Technology Programs was decided against this year because of declined enrollment.