Program Review
2002
Diesel Service Technology

Portland Community College
Rock Creek Campus
The successful Diesel Service Technology Program graduate will be able to confidently enter industry employment with skills and knowledge to perform entry level work, as defined by industry.

The mission of Portland Community College Diesel Service Technology is to provide first rate education for our students and to keep the community informed of the services and opportunities in the diesel industry. We will strive to meet this mission by: keeping current with technology, tooling, training and equipment, providing hands on real world experience, informative lectures, and practical applications, and working with the diesel industry employers and groups to insure successful employment. We will carry out this mission while keeping with the mission and goals of Portland Community College for a safe, fair, and diverse environment.
Instructors and Staff

Russ Dunnington, Instructor and Department Chair
Dale Kleier, Instructor
Robert Bonner, Instructor
Steve Leptschat, Instructor
Annette Murphy, Technical Skills Learning Specialist
Bob Cook, Instructional Assistant
Linda Christensen, Administrative Assistant
Stuart Savin, Department Dean

Advisory Committee

Gary Frey
Andersson Truck Parts

Ronn Schrenk
Schneider National

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EE Equipment

Tom Strassen Jr.

Ray Hondl
Tri Met

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Local 1005 I.A.M.&AW

David Switzer
Washington Co. fleet

Chauney Sprague
Western Power and Equipment

Max Smith
Cummins Northwest

Gary Carver
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Steve Ryan
The Halton Co.

Don Taylor
City of Portland

Don Clyde
The Halton Co.

John Anderson
Anderson Truck Parts

Joe Albert
Freightliner Corp.

Ken Ottwell
Pacific North Equipment

Michael Dunagan
Brattain International

Mark Troutman
Foss Marine

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HCR Hydraulics, Inc.

Terry McLean
Interstate Distributor Co.

Erwin Forbragd
Detroit Diesel Allison

Jeff Scholz
City of Portland

Dave Webb
Tri-Met

Gary Wertz
AG West Supply

Portland Community College Members:

Robert Bonner
Russ Dunnington
Dale Kleier
Robert Cook
Stuart Savin
Kristin Thomas
Marilyn Davis
Annette Murphy
Steve Leptschat
• **National and Professional Curriculum Standards:**

_This program review_ has been ongoing for three years. We, as a department SACC, have been rewriting our course content guides to reflect the “Outcome Base” requirement and to update the individual class content to reflect industry needs and maintain the department’s ASE/NATEF accreditation.

_During this review_, the SACC decided to not maintain several seldom used industry classes. These were allowed to expire and disappear from the catalogue. If needed again, they can be rewritten in the new format and reinstated.

The diesel program at Portland Community College is pending recertification by the Automotive Society of Excellence (ASE) through the National Automotive Technical Education Foundation (NATEF).

ASE was founded in 1972 as an answer to the automotive industry having a bad reputation. The Congress of the United States was going to hold hearing on the subject, when industry stepped in and wanted to handle the problems internally. Research showed that technician education was more the problem than unscrupulous mechanics and shops. ASE was formed to set standards for technicians and shops. To become ASE certified, The technician had to pass a test of knowledge. The “ASE Certified” sign in the shop window became the beacon for people who wanted the best.

In 1983, ASE saw a need to have certified training programs. The National Automotive Technician Education Foundation (NATEF) was formed as a testing division of ASE. They set the standards and tasks to be offered by a certified school and approached Community Colleges to become certified.

All of our classes are prepared in a way to fulfil the requirements of ASE certification. There are many requirements to be met, such as actually doing certain tasks, opposed to just reading about them. These tasks are chosen by industry people to reflect the skills needed in the current job market. Another is having an active industry advisory committee. The advisory committee helps to keep the program on course to meet local and national needs.

• **Results of Assessments of Program Outcomes**

_Changes to our program_, to keep us current with industry and our ASE/NATEF certification, are a continuing process. We are working on an increase in time in the Brakes and Suspension Course to include hydraulic brakes in addition to the air brakes already being taught. This will shorten the Tune up module that follows Brakes and Suspension, but we are working to rearrange other courses to take the shorted tune up. Engine Rebuild will incorporate Cummins Engine tune up and Fuels will take on Caterpillar Engine tune up. Hydraulic class will teach some of the Power Steering to help with the time crunch in Brakes and Suspension.

_Another course_ that is working on a change is Fundamentals of Electricity. Digital Multimeter and other electrical measuring and testing tools will be covered more and the “hands on” part will be expanded.
Learning Outcomes:

DS 101: **Shop Procedures and Engine Rebuild**, formerly two separate six credit classes, have been combined into one outcome based twelve-credit class. This achieved the result of having the student learn shop practice, tools, safety, etc while working on an engine instead of practice projects and gives them more time on the engine rebuild part of the class.

Two Detroit series 60 electronic engines have been added to the Cummins and Caterpillar selection options for the students to choose for their rebuild project. This will allow the student a better engine selection to match their needs.

**Intended Outcome:**

- In this class, the student will disassemble, inspect, reassemble, and run an operative diesel engine to identify how all of the internal systems become a functional unit.

- Gain knowledge of how and why diesel engines work.

- Learn about the tools and materials needed to properly repair and maintain diesel engines.

- Learn skills in engine failure diagnoses and practice researching the failure symptoms in service manuals and other sources to research and diagnose engine failures.

- Practice personal safety by using protective gear and safe procedures in all work areas.
DS102

**Truck Power Trains** has been rewritten to outcome base. The “Introduction of Electronic Controlled Transmission” self-paced certification program has been added. Update to clutches with a cut away clutch stand. Drive line and the working angles with aid new tooling and computer software has been added. Truck monitoring systems, axle and transmission temperature overview and trouble shooting class work has been added.

**Intended Outcome:**

- In this class students will disassemble inspect, reassemble and understand the power flow of a variety of transmissions.
- The student will gain knowledge of how and why diesel engine clutches work.
- Learn about the tools and materials needed to properly repair and maintain power trains and their components.
- Develop skills in failure diagnosis and researching the failure symptoms in service manuals.
- Practice personal safety by using protective gear and safe procedures in all work areas.
- Develop skills needed to attain employment through a mock employment interview.

DS103

**Fuel Injection Systems** has been rewritten to outcome base. The focus of the course has shifted from component overhaul to system diagnostics and troubleshooting. Fuel system theory, engine performance and component identification are stressed.

**Intended Outcome:**

- The student will develop skills to disassemble, inspect, reassemble and test fuel injection components and understand the relationship between component failure and engine operation.
- Develop knowledge of how diesel engines operate.
- Develop resume and cover letter writing skills.
- Develop skills in diesel fuel system failure diagnosis.
- Practice personal safety by using protective gear and safe procedures in all work areas.
DS104

*Fundamentals of Electricity and Electronics* has been rewritten to reflect the outcome base requirement and what industry wants in our graduates. A larger portion of time, and another workbook, has been allotted for learning digital multimeter use and understanding. Increasing the students “hands on” learning time makes for better information retention.

**Intended Outcome:**

- In this class the student will acquire knowledge of how and why automotive electricity works.
- Learn about the tools and material needed to properly diagnose, repair, and maintain electrical systems.
- Learn to identify and read electrical schematics, diagrams, and drawings.
- Develop skills in electrical failure diagnosis.
- Practice personal safety by using protective gear and safe procedures in all work areas.

DS105

*Fundamentals of Hydraulics and Air Conditioning* have been rewritten to outcome base. We have incorporated air conditioning systems into the curriculum and acquired all the necessary tooling and supplies to teach air conditioning, heating and ventilation, in detail. A new hydraulic cylinder test bench has been purchased to aid in teaching large bore cylinders. As of spring 2001, a new text has been implemented, *Vickers Mobile Hydraulics Manual*. Both instructors have completed factory training from Vickers and are currently developing lab activity sheets to supplement the new text.

**Intended Outcome:**

- The student will develop skills to disassemble, inspect, reassemble and test hydraulic components and understand the relationship between component failure and hydraulic system operation.
- Develop knowledge of how hydraulic and air conditioning systems operate.
- Develop a technical research paper.
- Develop skills in hydraulic and air conditioning system failure diagnosis.
- Practice personal safety by using protective gear and safe procedures in all work areas.
DS 106
**Engine Diagnostic Tune up** has been rewritten to outcome base. The 60 series Detroit Electronics software diagnostic program has been updated to the latest version. DDL 4.1 has been added and is in use. Class work sheets, materials have been updated. PowerPoint presentations are an added part to the tune up class. Two Sterling trucks from Freightliner have been added with 60 Series engines for live diagnostics. Instructor went to Detroit Diesel's factory training in Detroit, Michigan.

**Intended Outcome:**

- Develop knowledge of diesel engine diagnostic tune-up.
- Develop knowledge of how to analyze and diagnose diesel engine support systems.
- Learn about the tools and materials needed to properly analyze and tune up diesel engines.
- Practice personal safety by using protective gear and safe procedures in all work areas.

DS 107
**Live Equipment and Lab** has been rewritten to outcome base. This course is offered for students who are not seeking a degree or a certificate. The class was created for those individuals who wish to learn specific skills or complete specific projects. Often students who own equipment, boats or other diesel-powered equipment take this class to better familiarize themselves with the systems they will be using. The course is generally offered as pass no pass.

**Intended Outcome:**

- The outcome if this class is variable, depends on what the student wants to achieve.
DS 202
**Heavy Duty Power Train** has been rewritten to outcome base. Introduction of electronic controlled automatic transmission has been updated with new training aids and computer software. New class work papers with use of a new updated textbook and student workbook. More hands on work with automatic transmission valve bodies and system operation and troubleshooting.

**Intended Outcome:**

- Disassemble, inspect, reassemble and understand the power flow of a variety of heavy-duty transmissions used in on and off road automatic and power shift transmissions.
- Knowledge of how torque converters work and where the are used.
- Learn about the materials needed to properly repair and maintain heavy-duty power trains and their components.
- Develop skills in failure diagnosis and researching the failure symptoms in service manuals.
- Practice personal safety by using protective gear and procedures in all work areas.

DS 203
**Fuel Injection System Diagnosis and Caterpillar Electronic Engine** has been rewritten to outcome base. Fuel injection pumps are still a part of the curriculum but not to the extent of past years. There is a strong emphasis on complete system diagnostics and troubleshooting. Caterpillar electronics has been expanded due to the high percentage of electronics used in today’s diesel engines. Approximately 40% of the course is now dedicated to the understanding, troubleshooting and repair of Caterpillar electronic engines.

**Intended Outcome:**

- Develop skills to disassemble, inspect, reassemble and test fuel injection pumps and governors and understand the relationship between component failure and engine operation.
- Develop skills to diagnose, repair and program Caterpillar electronic engines.
- Develop skills in diesel fuel injection pump and governor failure diagnosis.
- Develop job search skills.
- Practice personal safety by using protective gear and safe procedures in all work areas.
DS204
**Diesel starting and Charging Systems** has been rewritten to reflect its outcome base format. This course continues to be a “hands on” class with many projects. Starter removal and reinstallation has been added as has been truck to trailer electrical diagnosis.

**Intended Outcome:**

- Learn the different components of an automotive electrical system, how they all work together a unit and how to properly diagnose and repair failures.
- Acquire knowledge of how and why electric motors and generators work.
- Learn Cummins electronic engine controls and diagnosis.
- Learn about the tools and materials needed to properly repair and maintain electrical systems.
- Learn to properly test and repair automotive electrical systems.
- Develop skills in electrical failure diagnosis.
- Practice personal safety by using protective gear and procedures in all work areas.

DS 205
**Mobile and Hydrostatic Hydraulics** has been rewritten to outcome base. As in DS 105, a new text has been implemented, Vickers Mobile Hydraulics Manual. Both instructors have completed factory training from Vickers and are currently developing lab activity sheets to supplement the new text. Bobcat provides a new Bobcat skid steer each year for the training of our students. We have an affiliate agreement with Bobcat in which they provide us with components and technical information and we provide a site for their training. We have acquired three used backhoes in recent years as well as numerous pumps, valves and cylinders.

**Intended Outcome:**

- Develop skills to disassemble, inspect, reassemble and test hydraulic and hydrostatic components and understand the relationship between component failure and hydraulic and hydrostatic operation.
- Develop knowledge of how hydraulic and hydrostatic systems operate.
- Develop skills in hydraulic and hydrostatic system failure diagnosis.
- Practice personal safety by using protective gear and procedures in all work areas.
DS 206
**Brakes, Suspension and Steering** has been rewritten to outcome base. The latest ABS systems have been added to the class. Including the new PLC (power line communications) ABS. Another air brake trailer has been added as a teaching aid. Two updated Sterling trucks from Freightliner have been added with air systems and Bendix ABS. Instructor has been to factory training at Meritor in Detroit, Michigan on ABS, air systems, and brake foundation parts. He has also been to Haldex Midland for air brake factory training in Kansas. Locally has been to Freightliner’s factory training in Portland, for air brake training, ABS, foundation brakes, and hydraulic brakes used in Freightliner trucks.

**Intended Outcome:**

- Disassemble, inspect, reassemble and understand components of air brake systems, truck foundation brakes, antilock brake systems, steering systems, suspension systems, wheels and tires, and fifth wheels.
- Knowledge of how brake and suspension systems work
- Learn about the tools and materials needed to properly repair and maintain brake systems, steering systems, suspension systems, wheels, tires, and fifth wheels.
- Skills in failure diagnosis and practice researching the failure symptoms in service manuals and other sources, to research and diagnose failures.
- Practice personal safety by using protective gear and safe procedures in all work areas.

DS 280 A
**Cooperative Education, Agriculture** has been rewritten to an outcome base. The class has been improved by adding 11 goals and objectives that the student can choose from. The purpose of the goals and objectives is to help guide the student though all the CO-OP classes by defining which skills and type of equipment and system the student will be learn on and from. Student will be keeping a journal to keep track of progress in meeting his objectives.

**Intended Outcome:**

- Demonstrate professional work ethics(habits)
- Apply agricultural equipment procedures in a variety of shop situations.
- Appraise learned skills by providing a weekly written report.
- Become familiar with employer expectations.
- Practice personal safety by using protective gear and safe procedures in all work areas.
• **Job outlook for our graduates:**

  *Research of our industry* has shown that there is a demand for our graduates. An Oregon Department of Employment survey shows a need for one thousand technicians in the next several years. The Diesel Advisory Committee consensus is that, although there is a slow down right now, they still need entry level technicians to fill retirement openings. The same Oregon Department of Employment also described the nearing retirement of large numbers of “baby boomers”, with a smaller generation population to replace them. This will tend to make our graduates even more in demand than they are presently.

The following chart from the Oregon Employment Department gives a statewide example with comparison with Multnomah, Washington, and Tillamook Counties.

This chart only represents employers listing jobs with the Oregon Employment Department.

Many employers advertise and conduct their own searches independently of the Oregon Employment Department, which would increase these numbers.
Occupational Summary for Bus & Truck Mechanics in Region 2 (Multnomah / Tillamook / Washington)

Description: Repair and maintain the operating condition of trucks, buses, and all types of diesel engines. Include mechanics working primarily with automobile diesel engines.

**Employment Projections**

<table>
<thead>
<tr>
<th>Region</th>
<th>Employment 2000</th>
<th>Employment 2010</th>
<th>Percent Change</th>
<th>Change</th>
<th>Annual Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>4,722</td>
<td>5,267</td>
<td>11.5%</td>
<td>545</td>
<td>104</td>
</tr>
<tr>
<td>Region 2</td>
<td>1,925</td>
<td>2,113</td>
<td>9.9%</td>
<td>190</td>
<td>39</td>
</tr>
</tbody>
</table>

**Wages**

<table>
<thead>
<tr>
<th>Region</th>
<th>Median Hourly</th>
<th>Avg Annual</th>
<th>Middle Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>$17.84</td>
<td>$36,868</td>
<td>$14.70 - 20.77</td>
</tr>
<tr>
<td>Region 2</td>
<td>$19.06</td>
<td>$40,196</td>
<td>$17.74 - 21.65</td>
</tr>
</tbody>
</table>

**Current Job Openings**

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Location</th>
<th>Order Number</th>
<th>Wage Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck Mechanic</td>
<td>Swan Island</td>
<td>111031</td>
<td>$15.00/hr</td>
</tr>
<tr>
<td>Mechanics/Mechanic Ops</td>
<td>Troutdale</td>
<td>1063452</td>
<td>$12.00/hr</td>
</tr>
<tr>
<td>Heavy Truck Diesel Mech</td>
<td>St. Johns</td>
<td>1119252</td>
<td>$14.00/hr</td>
</tr>
<tr>
<td>Diesel Mechanic</td>
<td>Portland</td>
<td>2818328</td>
<td>$12.00/hr</td>
</tr>
<tr>
<td>Tractor Mechanic</td>
<td>New Pld</td>
<td>1077950</td>
<td>$13.00/hr</td>
</tr>
<tr>
<td>Trailer Mechanic</td>
<td>New Pld</td>
<td>1077360</td>
<td>$13.00/hr</td>
</tr>
<tr>
<td>Mechanic / Repair</td>
<td>Sutherlin</td>
<td>3100586</td>
<td>$14.50/hr</td>
</tr>
<tr>
<td>Mechanic / Repair</td>
<td>Sutherlin</td>
<td>3200565</td>
<td>$14.50/hr</td>
</tr>
<tr>
<td>Mechanic</td>
<td>Salem</td>
<td>2100815</td>
<td>$12.00/hr</td>
</tr>
<tr>
<td>Field Service Tech.</td>
<td>Oakland</td>
<td>2199715</td>
<td>$16.15/hr</td>
</tr>
<tr>
<td>Diesel Mechanic <em>Truck</em></td>
<td>Scio</td>
<td>2700195</td>
<td>$12.00/hr</td>
</tr>
<tr>
<td>Heavy Duty Mechanic</td>
<td>Prineville</td>
<td>7234375</td>
<td>$13.00/hr</td>
</tr>
<tr>
<td>Heavy Duty Mechanic</td>
<td>Portland</td>
<td>8109183</td>
<td>$12.00/hr</td>
</tr>
</tbody>
</table>

Statewide Employment Analysis:
2000 employment in this occupation is estimated to be much larger than average. Growth is projected to be about as fast as average. Annual new openings are expected to be much higher than average. A few Bus and Truck Mechanics are self-employed.

Statewide Outlook:
Reasonable employment opportunities exist for competitively trained workers.

Educational Requirements:
Workers must have long term on-the-job training to gain the necessary skills for this occupation. However, those with an associate degree would have a competitive advantage in this labor market.

Oregon Employment Department © 2001 - 2002
Internal surveys show that all of our graduates that want jobs are getting them. Approximately 85% are working in the industry.
The starting wages, over the proceeding years, have risen until this year. They are down a little because of the economy, but they will go back up as the job market improves.
Enrollment:

Our enrollment has fluctuated somewhat with the economy, when things are going good and industry can’t get enough workers, our enrollment dips a little, but seems to recover when industry requires a degree for employees. Our enrollment goes up during times that are not so good because of retraining displaced workers.
This enrollment chart covers from fall of 1997 through spring of 2002. Each year is broken down into three terms, except 99-00, which has a summer class of one student. This was a non-core class. Each term is broken down into two modules of six weeks each.

The first two columns in each term are the core class enrollment and the third one, with a decimal number, is the FTE’s for that term. The terms with four columns have an extra non-core class being taught.

The chart shows a decline in student enrollment during the 1999-00 year. This prompted an aggressive student recruitment program. The student numbers began to rise again, somewhat helped by workforce retraining students being sent to us by the government. Our recruitment with local High Schools and with other areas has resulted in increased student enrollment.
Recruitment:

The program instructors maintain a good relationship with the local high schools by loaning running diesel engines to their automotive departments and by going, in person, to the schools and presenting some training. This is helpful in recruiting new students into the diesel industry and getting them into our program.

We also host a Hi School “Diesel Day”. This brings as many as three hundred students from local high schools into our college to see first hand the training they will get in our program. Industry participates in this day by providing equipment, door prizes, and other materials.

Scholarships:

There are several scholarships available to students. Northwest Diesel Industry Council, Cummins Engine Company, and Case Power and Equipment each have limited money available to students who apply and qualify. The Fred Dewitt Memorial Scholarship for Excellence is awarded when funds are available. There are also Portland Community College Foundation scholarships available for students.

Special training:

Our program utilizes a Technical Learning Skills Specialist to do advising and to assist students who need extra help in reading, math, and writing. Also special instruction, such as resume writing and job interview, is imbedded into the individual core classes and is covered by a combination of PCC Staff and Industry volunteers.

- Faculty Professional Development

Several Instructors have decided in the last year to work toward their Master ASE Certification in order to become members of the Automotive Society of Excellence (ASE) National Automotive Technician Education Foundation (NATEF) accreditation team. This will mean that the Portland Community College Diesel Instructors will participate with ASE to certify the diesel programs throughout the northwestern United States that need accreditation review.
Diesel Service Technology Industry involvement:

As always, the Instructors are keeping close ties to industry in order to keep our program up date and as close to industry requirements as possible. This is accomplished by utilizing an Industry Advisory Committee and going to industry training sessions concerning the diesel industry, especially the topics they teach. Some examples are Vickers Hydraulic Factory Training, Electronic Engine and Transmission Factory Classes. Also, each year, the Instructors attend a “Diesel Instructors Conference” where industry trainers present the latest products, service techniques, and training aids.

The Diesel Service Technology program has both formal and informal agreements with local dealerships and local and non-local manufactures.

We are one of thirteen colleges in North America who has an affiliation agreement with Bobcat of America. In this agreement, we provide a training site for level III courses and provide an instructor for Level I and Level II courses. As part of this agreement, Bobcat provides us with service literature; components, software, technical support and a new skid steer each year. We also have the opportunity to attend training at their corporate site in North Dakota.

We were instrumental in organizing and are charter members of the Northwest Diesel Industry Council (NDIC). This is an organization made up of industry, private people and colleges, with a focus on supporting diesel programs with recruitment and the acquisition of training equipment.

We have a Partners On The Road agreement with Meritor, a major transmission manufacturer. Through this agreement, Meritor supplies us with training support and materials and we provide them with a training site.

GM Isuzu commercial truck is another manufacture with which we have a training agreement. This agreement is similar to Meritor in that we provide a training site and they provide us with equipment and materials.

The Diesel Service Technology program has developed relationships with many other dealers and manufacturers. They provide us with free training, scholarships, technical support, training materials, product specific software and equipment. Some of these companies include: Midland Haldex, Freightliner, Pacific Detroit Diesel, Detroit Diesel Engine Corporation, The Halton Company, Caterpillar Corporation, Anderson Brothers Truck Parts, Cummins Northwest, Equipment Maintenance Council, Oregon Trucking Association, Eaton Vickers, Fluid Power Connectors and Parker Hannifin.

Many other companies help us in any way they can, and as a whole, we receive tremendous industry support.
Articulation Agreement with four year program: Bachelor Degree:

During the last several years, an agreement with Oregon Institute of Technology, Portland Campus has been worked out to implement a bachelor degree allowing the graduates of diesel and other technical programs, with associate degrees from PCC, to continue on and receive a degree in “Operations Management”. The new program will make our Diesel Program more valuable to our prospective, current, and former students and unique in the northwest.

Commercial Driving License:

Due to the requirement of a Commercial Driving License (CDL) to drive the larger field service trucks and test drive the large commercial freight trucks, our students have requested a driving class to be included in our program. An agreement with a local Truck Driver Training School is being worked out to provide this service.

Over all, the diesel program is right on track with curriculum and industry needs and through ongoing review and improvements, we will continue to maintain the excellence of our program.