Eastern West Virginia Community and Technical College
COURSE ASSESSMENT REPORT

Course Title and Number: **ELM 120 3 cr. hr.** **Fundamentals of Fluid Power**	**Academic Term and Year of Assessment Activity (Ex: Fall, 2014)** **Fall 2014**
Report Submitted By: Skip Landes	**Number of Students Assessed: 14**
Date Report Submitted: May 13, 2015	**Number of Sections Included: 1**
Course Delivery Format (list all modalities used in sections assessed. Ex: web based, VDL, traditional section, hybrid course, etc.): Lecture/Lab course and traditional delivery.	

Course Role in the Curriculum **Provide a description of the role the course serves in the curriculum (i.e. general education requirement, program technical core, restricted elective, etc.). Note all as appropriate.**
ELM 120 is a technical core requirement (3 credits) for Wind and Industrial Technicians in both the certificate and associate degree programs. This course introduces the student to the theory and application of fluid/air power. Hydraulic and pneumatic devices and circuits will be studied. The construction, function and application of these devices will be emphasized. Fluid/air power schematics, circuity, instrumentation and control will be investigated.

Assessment Methods **Provide a description of the assessment process used. Include description of instrument and performance standards in description. Note all methods.**
The ELM 120 course assessment report focuses on the principles of flow, pressure, velocity of fluids. Labvolt Lab manuals were used as the basic data collection instruments for this assessment. The manuals gave the student task questions that require both calculated as well as hands on lab answers. Theoretical lab answers are compared to actual measured answers from the equipment being used. Review questions at the end of each section re-enforced the outcome results. All students had to work both hydraulic and pneumatics exercises for the listed outcomes assessed. The Outcomes being assessed and method used are as follows: 1. **Define the relationship between pressure, force and area in Pascal's Law.** Pneumatics – Exercise 2-1 - Review Question 1 : According to the relationship between force, pressure and area, the force maybe calculated using the formula: Answer (B) F=P X A Hydraulics – Exercise 2-2 Review Question – 3: How much pressure must be applied to the cap end of a 2.54cm (1") bore cylinder in order to compress a spring 5.08cm (2") if the spring rate is 728 N/CM (416lb/in) Answer – 7298 kPa (1059 PSI)

2. **Apply Pascal's Law using proper terminology and units**.
   Pneumatics – Exercise 2-1 Pressure VS Force -- Lab task Table 2-1 – Conversion of pressure to force
   Hydraulics- Exercise 2-2 Pressure and Force – Lab task Table 2-2 -- Cylinder force versus pressure.

9. **Calculate the flow rate in a hydraulic system**.
   Hydraulics- Exercise 2-3 Review Question – 3: What flow rate is required to make a 10.16cm (4in.) bore X 3.81cm (1.5in) rod X 30.48 cm (12 in) stroke cylinder extend in 6 seconds?
   Answer – 24.71/min (6.52 gal./min)

20. **Explain the function of a pressure control valve**.
   Hydraulics – Exercise 2-1 – Review questions 2-1 Question 1 What is the purpose of a relief valve?
   Answer – To limit the max. system pressure

32. **Calculate the velocity of a linear actuator**.
   Hydraulics – Exercise 2-3 – Review Question 3
   What flow rate is required to make a 10.16cm (4 in) bore X 3.81cm (1.5 in) rod X 30.48cm (12 in) stroke cylinder extend in 6 seconds.
` Answer – 24.7 l./min (6.52 gal./min)

44. **Calculate the pressure, volume and temperature results using the Ideal Gas Law**
   Pneumatics – Exercise 2-2 Task 8
   Using Boyle's Law calculate the theoretical final pressure P2
   Answer - $Pa = \frac{P1 \times V1}{V2} = 2P1 = 20 \qquad P1 = 10$

Assessment Results

Provide a summary of results including tables/charts. Incorporate information from previous assessments as appropriate. Append additional pages if necessary. If appending, include notation in box to "See attached".

Course Outcomes	Numbers of Student answering Correct	Number of Students answering Wrong	Composite Score
Outcome #1	9	3	12
Outcome #2	10	2	12
Outcome #9	10	2	12
Outcome #20	12	0	12
Outcome #32	10	2	12
Outcome #44	12	0	12
Total Answers	63	9	72
Percentage	87.5%	12.5%	100%

Course Level Assessment Summary of Outcomes, Indicators and Results
Course Title and Number : ELM 120 Fluids Power
Number of students in assessment sample = 14
Number of Sections in Assessment = 1
Add additional rows to table if necessary

Learning Outcomes (Insert learning outcomes assessed during this cycle)	Indicator (Insert indicators used for each outcome: exam question, scoring rubric, etc. Be specific)	Percent of Correct Responses	Percent of Incorrect Responses	Performance Standard Met (75%)* (yes or no)
Outcome 1:	Pneumatics – Exercise 2-1 - Review Question 1 : According to the relationship between force, pressure and area, the force maybe calculated using the formula: Answer (B) F=P X A Hydraulics – Exercise 2-2 Review Question – 3: How much pressure must be applied to the cap end of a 2.54cm (1") bore cylinder in order to compress a spring 5.08cm (2") if the spring rate is 728 N/CM (416lb/in) Answer – 7298 kPa (1059 PSI)	75%	25%	yes

Outcome 2:	Pneumatics – Exercise 2-1 Pressure VS Force -- Lab task Table 2-1 – Conversion of pressure to force Hydraulics- Exercise 2-2 Pressure and Force – Lab task Table 2-2 -- Cylinder force versus pressure. Answer – Fill in table from lab	83%	17%	Yes
Outcome 9:	Hydraulics- Exercise 2-3 Review Question – 3: What flow rate is required to make a 10.16cm (4in.) bore X 3.81cm (1.5in) rod X 30.48 cm (12 in) stroke cylinder extend in 6 seconds? Answer – 24.71/min (6.52 gal./min)	83%	17%	Yes
Outcome 20:	Hydraulics – Exercise 2-1 – Review Question 1 What is the purpose of a relief valve? Answer – To limit the max. system pressure	100%	0%	Yes
Outcome 32:	Hydraulics – Exercise 2-3 – Review Question 3 What flow rate is required to make a 10.16cm (4 in) bore X 3.81cm (1.5 in) rod X 30.48cm (12 in) stroke cylinder extend in 6 seconds. Answer – 24.7 l./min (6.52 gal./min)	83%	17%	Yes
Outcome 44:	Pneumatics – Exercise 2-2 Task 8 Using Boyle's Law calculate the theoretical final pressure P2 Answer - $Pa = \frac{P1 \times V1}{V2} =$ 2P1 = 20 P1 = 10	100%	0%	Yes

* Please note if using a different minimum performance standard.

Conclusions **Provide a brief summary of conclusions derived based on analysis of data. Append additional pages if necessary. If appending, include notation in box to "See attached".**
The results of Outcome #1 reflects the lack of math skills to understand the relationship of Pascal's Law. I used Outcome #2 because it is a hands-on exercise proving Pascal Law. This outcome required the student to read and set up the lab exercise to find the results. Those that missed the correct results did not follow directions given in the lab work book. Outcome #1 required the math answer while Outcome #2 gave you a real world comparison to prove the Law. Outcome #9 again has math that would be required to find the correct answer and Outcome #32 also made the student use math for the answer. The only outcome that everyone scored correctly using math was Outcome #44.

Previous Assessment Reports and Results **Date of Previous Assessment: N/A - This is the first assessment completed for this course.** **List of Outcomes Not Met: N/A** **Summary of Actions Taken to Address Unmet Learning Outcomes: Append additional pages if necessary. If appending, include notation in box to "See attached".**

Action Plan and Date for Reassessment **Identify action plan for improvement or maintaining current performance levels including outcomes identified for re-assessment, curriculum revision, LOT proposal, new or revised course activities to reinforce learning outcomes, etc. Append additional pages if necessary. If appending, include notation in box to "See attached".**
I believe that the small amount of math in this course should not be a problem but another way of presenting the formulas is needed. I did try work sheets using the formulas and different values so the practice on the math sections would help. The hands on lab is another problem in that it deals with someone reading and following instructions. Reading is important to anyone working in the maintenance field and understanding how a machine works by reading about its operation. I had thought about reading the lab instructions to these students but that only puts off the problem. I guess that a test on the lab assignments before lab would tell me if they understand what is needed. That would have to be the next step in this course.

Assessment Committee Recommendation/Approval **(To be posted by Assessment Committee Chair)**
✠ Approved as presented **Date: 09/09/15**

LOT Recommendation/Approval

(To be posted by Assessment Committee Chair)
❾ Approved as presented **Date: 09/21/15**