

Eastern West Virginia  
Community and Technical College



Program Review  
Certificate in Electromechanical Technology (C.A.S.)  
2016

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Approved by Assessment Committee: 8/15/17 (e-vote)  
Approved by LOT Committee: 8/21/17  
Approved by Cabinet: 9/5/17  
Approved by Board of Governors: 9/13/17

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CIP Code: 22150499  
Eastern West Virginia Community and Technical College

**Program Overview**

The Electromechanical Technology Certificate (ELM) program was created by incorporating existing courses from the former Industrial Maintenance program; an ELM degree requires 30 credits hours consisting of nine general education credits and twenty-one technical core credits. The Industrial Maintenance program was developed to satisfy local industry needs at that time, and several years later it became apparent that a broader approach was needed. Many industrial maintenance courses were modified and expanded to fully train maintenance personnel and better suit current regional needs. However, as with many industries the real push was for “skills training” and not as much interest in an academic degree, so enrollments and number of degree-seeking majors had been low.

Currently, the ELM program is an integral part of Eastern’s Wind Technician Training program (WTT). Many students coming into the WTT program are only interested in maintenance training, not necessarily wind turbine training. Thus, the ELM program now serves as a degree alternative to the WTT program, which has increased ELM enrollments in recent years. By offering dual Electromechanical and Wind Turbine Certificates, Eastern can continue to offer these courses and serve a larger number of students.

The Electromechanical program has been integrated into the Wind Technician Training Program. As Eastern combined these offerings, it was obvious that some course outcomes needed to be changed. These courses were successfully changed to meet the needs of industry by utilizing existing and new partnerships. Several advisory committees are held annually to review course offerings and actual course content. Through the advisement of its partners, Eastern has been able to make both the Wind and the Electromechanical programs work together as well as contain trainings needed by industry. By offering both programs on a parallel track, the program has become more flexible and useful for students.

Students select classes from the following course sequence in the ELM program:

First Year—Fall Semester				First Year—Spring Semester			
Dept.		Course Title	Sem. Hrs.	Dept.		Course Title	Sem. Hrs.
CIS	108	<a href="#">Computer Fundamentals</a>	3	ELM	210	<a href="#">PLC Fundamentals</a>	3
ENL	101	<a href="#">English Composition I</a>	3	ELM	217	<a href="#">Industrial Maintenance Fundamentals</a>	3
ELM	120	<a href="#">Fundamentals of Fluid Power</a>	3	Elective		Mathematics Elective (MTH 115 or higher)	3
WTT	110	<a href="#">Wind Safety and OSHA</a>	4	WTT	150	<a href="#">Industrial Motor Controls</a>	4
WTT	120	<a href="#">DC/AC Circuits</a>	4				
<b>Total Semester Hours</b>			<b>17</b>	<b>Total Semester Hours</b>			<b>13</b>

Upon completion of this certificate, graduates will be able to:

1. Apply accepted safety and health practices in the workplace.
2. Demonstrate a working knowledge of the construction, operation and function of components and devices used in mechanical, electrical, and fluid power systems.
3. Apply principle, knowledge, and analysis skills in troubleshooting, repairing, and maintaining mechanical, electrical, and fluid power systems.

4. Use tools and instrumentation to troubleshoot and/or repair industrial equipment and systems.
5. Read, interpret, and design schematics and writing diagrams for mechanical, electric, and fluid power systems.
6. Apply effective written communication and computation skills.
7. Demonstrate computational skills to solve problems involving parameters contained in mechanical, electrical, electronic, and fluid power systems.
8. Demonstrate computer literacy.

### **Synopsis of Significant Findings: Meeting Learning Outcomes**

8 Course Assessment reports were submitted between Spring 2013 and Fall 2015. Of these, 4 (50%) showed that 75% or more of their learning outcomes had been met. Full data from submitted Course Assessment reports can be found in Appendix A.

The 4 reports which showed that the benchmark had not been met were distributed as follows:

MTH 115 – 1  
ELM 217 – 1  
CIS 114 – 1  
ENL 101 – 1

MTH 115: Business Math

- The last Course Assessment report was completed in Fall 2016, where 1 of 4 outcomes were met at 75% or greater. The next Course Assessment report is due Fall 2018.
- The pass rate of the one section offered in Fall 2016 was 70%.

ELM 217: Industrial Maintenance Fundamentals

- The next Course Assessment report is due Spring 2017
- The pass rate of the one section offered in Spring 2016 was 100%.

CIS 114: Introduction to Computer Applications and Concepts

- The next Course Assessment report is due Fall 2018.
- The combined pass rate of the four sections offered in Fall 2016 was 82%.

ENL 101: English Composition I

- The next Course Assessment report is due Fall 2017.
- The combined pass rate of the four sections offered in Fall 2016 was 96%.

In the absence of current Course Assessment reports, the most recent examination of the last available results suggest that the above courses are currently functioning adequately, and immediate investigation and intervention is not needed. Writers of the next Course Assessment reports for these courses should, as a matter of course, review previous reports and continue to address Learning Outcomes that have not been met to the 75% benchmark. Several Course Assessment reports have never been completed for electromechanical technical core courses, including ELM 210, WTT 110, WTT 120, and WTT 150. Faculty turnover and the need for a program assessment plan could be reasons for the dearth of Course Assessment reports in technical core courses. Writing Course Assessment reports on these listed courses

needs to be a priority before the next program review. Faculty has organized two professional development sessions centered on course assessment in May and August of 2017, which will help to train faculty in tracking course pass rates and accepted course-level assessment reporting practices.

### **Plans for Program Improvement**

The Electromechanical program was developed with the help of local industries throughout Eastern's six county service district; the goals of the program were to educate individuals to help them move to higher level positions within manufacturing organizations and to help supply future needs for a spectrum of maintenance technician employees. The improvement plan for the Electromechanical program begins with centering on Eastern's program review process itself. Generating strategies to institutionalize the use of assessment data to improve student learning and support curriculum improvement has already begun with the creation of annual program-level assessment reports, an adjunct assessment project, a hybrid full-time faculty/assessment facilitator position, and the adoption of Blackboard Data Analytics (BBDA) as a data tracking system. Eastern's Annual Program Assessment Reports will review at least three program outcomes over designated years, which will help Eastern generate more qualitative data. The piloted adjunct assessment project has recruited part-time faculty to conduct Master Course Record reviews, chart general education outcomes, create course-level assessments, and generate specific course assessment plans. Also, Eastern's recent adoption and training in BBDA will provide Eastern staff access to useable data, which will help analyze whether initiatives are effective.

Although Eastern follows the standard, state-wide cycle for program-level assessment and program review in its Assessment of Student Academic Achievement Report, the feasibility of creating annual program level assessments for all programs is a daunting task considering the lack of full-time faculty in certain content areas and the fact that Eastern currently has only two division chairs. Altering the program assessment cycle, by giving time to collect data, could refine the assessment process.

In the ELM program, Eastern is in the process of adopting Amatrol's eLearning solutions to fit the College's technical education needs. The creation of hybrid industrial maintenance courses utilizing Blackboard's learning platform and Amatrol's comprehensive curriculum will allow for group learning flexibility. Amatrol's eAssessment will also establish a knowledge baseline that can be used to tailor an effective learning plan for Eastern students.

Amatrol's eLearning curriculum can be cross-walked with Eastern's curriculum, which will help emphasize problem solving and analysis skills; moreover, Amatrol's eLearning includes all text materials, online learning modules, and hands-on lab instructions for approximately \$200 per student. By embedding a \$200 lab fee for each learner for a whole academic year, Eastern students will have access to all the materials needed for their industrial maintenance courses. Hybrid coursework will begin in Fall 2017.

### **Identification of Weaknesses/Deficiencies**

One of the weaknesses identified in Eastern's ELM program included the lack of embedded certifications or any kind of nationally recognized exit test. Beginning in March 2015, as a requirement of graduation, ELM graduates were required to take the National Occupational Competency Testing Institute (NOCTI) for Maintenance Technicians. Table 1 compares Eastern's student scores with NOCTI's post-secondary national averages.

**Table 1: NOCTI Maintenance Technician Subscores**

	<b>NOCTI Outcomes</b>	<b>Student 1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>Eastern's Students (Average)</b>	<b>NOCTI National (Average)</b>
<b>1</b>	<b>Safety</b>	87	76	73	76	78	68	65	84	78	89	76	57	76	<b>75</b>	<b>74</b>
<b>2</b>	<b>Equipment Operation</b>	100	100	100	100	100	100	100	100	100	100	100	100	100	<b>96</b>	<b>92</b>
<b>3</b>	<b>ELM Systems</b>	70	50	76	67	76	70	48	94	61	74	59	52	67	<b>66</b>	<b>68</b>
<b>4</b>	<b>Hand Tools</b>	90	47	68	47	58	42	58	84	58	79	56	52	63	<b>62</b>	<b>64</b>
<b>5</b>	<b>Mainten. Equipment</b>	90	80	67	53	90	67	63	83	83	70	57	47	80	<b>72</b>	<b>75</b>
<b>6</b>	<b>Computat., Technical, and Writing Skills</b>	81	67	91	67	81	71	43	91	86	--	57	52	86	<b>73</b>	<b>76</b>
<b>7</b>	<b>Intro to Careers in ELM Technology</b>	100	80	80	80	80	80	80	100	80	100	60	100	80	<b>85</b>	<b>87</b>
	<b>Average/ Student</b>	<b>88</b>	<b>71</b>	<b>79</b>	<b>70</b>	<b>80</b>	<b>71</b>	<b>65</b>	<b>91</b>	<b>78</b>	<b>85</b>	<b>64</b>	<b>63</b>	<b>76</b>	<b>76</b>	<b>79</b>

Eastern student scores are slightly below the national average, based on a small sample size, but Eastern graduates did outperform national averages in “Safety” and “Equipment Operation.” A limited amount of student NOCTI scores are available because of the College’s involvement in the Bridging the Gap (BTG) grant, which stipulated embedding industry standard certifications within specific courses.

Beginning in Fall 2017, to help embed certifications within the ELM program, Eastern became a mechatronics partner school with Packaging Machinery Manufacturers Institute (PMMI). Eastern is one of the first community colleges in West Virginia to become a mechatronics partner school with PMMI, who has reviewed, approved, and endorsed Eastern’s ELM curriculum. The following technical core courses are matched with embedded PMMI certification tests, which allows ELM students to earn industry standard certifications while enrolled at Eastern:

- ELM 120: Fundamentals of Fluid Power – PMMI Fluid Power 1 Certification Test
- ELM 150: Industrial Motor Controls – PMMI Motor and Motor Controls 1 Certification Test
- ELM 210: PLC Fundamentals – PMMI PLC 1 Certification Test
- Graduate Exit Exam – PMMI Industrial Electricity 1 Certification Test

Future program reviews will extrapolate and analyze data based on student PMMI scores to help improve program deficiencies. Eastern has also developed guided pathway graphic organizers for its ELM program, which allows students to easily visualize their degree pathway to career success and identify which courses are embedded with PMMI certification tests.

Another concern with the ELM program centers on enrollment. Although enrollment has steadily increased from Fall 2015 through Fall 2015, as seen in Table 2, more students in both the Electromechanical and Wind Energy program are needed for the program to thrive.

**Table 2: 5 Year Trend Data on Graduates and Majors**

<b>Semester</b>	<b>Headcount</b>	<b>FTE</b>	<b>Full-Time (%)</b>	<b>Graduates</b>
<b>Fall 2011</b>	1	.2	0 (0%)	
<b>Spring 2012</b>	0	0	0 (0%)	<b>2011-2012: 2</b>
<b>Fall 2012</b>	1	.9	1 (100%)	
<b>Spring 2013</b>	2	1.5	1 (50%)	<b>2012-2013: 8</b>
<b>Fall 2013</b>	3	3.1	3 (100%)	
<b>Spring 2014</b>	2	1.7	2 (100%)	<b>2013-2014: 9</b>
<b>Fall 2014</b>	4	3.5	4 (100%)	
<b>Spring 2015</b>	2	1.9	2 (100%)	<b>2014-2015: 11</b>
<b>Fall 2015</b>	2	1.6	1 (50%)	
<b>TOTAL</b>	17	14.4	14 (82%)	<b>Fall 2011-Spring 2015: 30</b>

Full-time instructor turnover has been a notable challenge to student recruitment, but with the hiring of Eric Putze in Spring 2017, the program looks forward to a period of stability and growth.

### **Summary of Assessment Model and Utilization for Program Improvement**

Eastern's assessment plan consists of three levels: entry level assessment (ACCUPLACER, SAT, ACT), active enrollment assessment (course and program assessment, student satisfaction surveys, etc.), and post-graduation assessment (employment satisfaction survey, alumni survey, employment and salary data, etc.). For a year (2015-2016), Electromechanical students participated in NOCTI, which delivers a battery of assessments for students studying career and technical programs at technical colleges in the United States. Since Spring 2017, Packaging Machinery Manufacturers Institute (PMMI) certification tests are used for exit and embedded course exams. IDEA Short Form Reports (i.e. course evaluation surveys) are administered each semester in all course sections with enrollment of six or more students. Course completion rates and student tracking studies are used as a measure of overall program success. All courses are assessed on a cyclical basis, and recommendations for improvements are funneled into the feedback loop so that future Course Assessment reports will address any course shortcomings. A summary of Course Assessment reports is provided in Appendix A.

An immediate assessment need in the ELM program concerns the number of Course Assessment reports completed for technical core courses. Only two Course Assessment reports have been submitted for ELM technical core courses (ELM 120 and ELM 217) between Fall 2011 and Spring 2015; again, the lack of a permanent instructor and program assessment plan have contributed to this shortfall. Course-level assessment needs to be priority before the next program review, which is being addressed with future professional development sessions on course assessment in May and August of 2017.

### **Data on Student Placement**

From Fall 2011 through Fall 2015, 30 students graduated with an Electromechanical major. Of these 30 students, student placement data has been collected on 21 students (70% of cohort). No information was available on 9 graduates:

- 16 students (76%) are employed full-time
- 3 students (14%) are employed part-time
- 2 students (10%) are unemployed
- 2 students (7%) are currently enrolled in B.A. programs
- 0 students (0%) are currently enrolled in M.A. programs
- 0 students (0%) graduated with baccalaureate degrees

## **Final Recommendations**

The recommendation is to continue offering the Electromechanical program in its current format. Finishing an Electromechanical degree at Eastern allows students to enter the workforce at the technician level. They will be prepared to troubleshoot, service, and repair equipment and system components used in industry and business, making Eastern's ELM program an important gateway to one of the largest growing industry sectors in West Virginia – industrial maintenance.

The following issues will be addressed during the next program review cycle:

1. By engaging adjunct faculty and full-time faculty in assessment of Electromechanical courses, measures of student learning could be continually assessed and revised. Faculty are the key to curriculum improvement, so professional development opportunities for faculty should center on assessment training. Holding annual assessment workshops or retreats would streamline the assessment process and emphasize Eastern's commitment to closing the feedback loop. Currently, there are two professional development sessions planned for course-level assessment in May and August of 2017. A program assessment plan will also be created for the ELM program by July 1, 2017.
2. Eastern needs to increase the number of completed Course Assessment reports in ELM technical core courses to reflect an increased emphasis on student learning. Unmet outcomes need to be re-evaluated in future reports emphasizing the importance of closing the feedback loop.
3. A focus on curriculum improvements based on assessment data would help overcome classic barriers to conducting meaningful assessment. Course mapping, the creation of rubrics or task sheets, and a data analysis of PMMI scores are examples of how Eastern's assessment process could be improved.
4. By utilizing Blackboard Data Analytics (BBDA) in the program review process, Eastern can identify and overcome barriers to student success and keep learners on track for graduation. Implementing BBDA in future program reports will institutionalize the use of assessment data and improve student learning. Creating periodical BBDA monitoring reports could help track program deficiencies and serve as an early alert system for needed curriculum revisions.
5. To increase existing enrollment figures, Eastern will need a cross-discipline marketing strategy, which includes an on-going recruitment effort, utilizing the resources at hand (i.e. faculty, staff, advisory committees, recent ELM graduates), and increasing program awareness within the Potomac Highlands region.

**Appendix A: Summary of Course Level Assessments for All Participating Students**

<u>Semester</u>	<u>Course Assessed</u>	<u># of Students</u>	<u>Outcomes Met at 75% or above</u>	
			<u>#</u>	<u>%</u>
Spring 2013	CIS 108	17	3 of 4	75
Fall 2013	CIS 108	25	13 of 13	100
Spring 2014	CIS 108	25	40 of 40	100
Fall 2014	ELM 120	14	6 of 6	100
Fall 2014	MTH 115	10	2 of 4	50
Spring 2015	ELM 217	10	2 of 5	40
Fall 2015	CIS 114	9	4 of 9	44.4
Spring 2012 –Spring 2015	ENL 101	235	17 of 24	70.8