

CNM ANNUAL STUDENT LEARNING ASSESSMENT REPORT

Due to the Student Academic Assessment Committee by October 15



PART 1: REPORT INFORMATION

| Report Year and Contact Information | | | |
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| <u>2017-2018</u> Academic Year | <u>Janet Hughes</u> Contact Person | <u>Jhughes41@cmn.edu</u> CNM Email | <u>53256</u> CNM Office Extension |

| Subject of this Report |
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| AT--ELTR_AAS--Electrical Trades Photovoltaic Concentration |

PART 2: CONTEXT IN WHICH THE ASSESSMENT TOOK PLACE

| Program/Area Highlights and Successes |
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| <p>(Wherever applicable, include course completion rates, job placement outcomes, and licensing examination pass rates. See the program information dashboard at https://livecnm.sharepoint.com/sites/Dashboards/SitePages/Program%20Information%20Dashboard.aspx (access restricted to CNM employees) and other reports at https://www.cnm.edu/depts/opie.)</p> <p>Successfully completed the build out the theory, assignments, quizzes and tests online for ELTR 2692, ELTR 2610, and ELTR 2630. Lecture videos were completed for ELTR 2620, and partially completed for ELTR 2630. There were 12 students registered in fall of 2017 and all completed with a passing grade. There were 9 students registered in the spring of 2018. 8 students completed with a passing score and 1 student dropped due to conflicting work schedule. The students take the NABCEP Associate Exam towards the end of the Advanced PV course ELTR 2630. In the spring of 2018, 7 out of 8 students taking the exam passed. The lab was successfully moved from the Workforce Training Center to Main campus at the end of fall 2017 semester. Spring of 2018 was spent setting up the lab and rebuilding out most of the lab stations. Over the last year I know of 12 students out of the PV program that have been hired by local solar industry. Most of them were hired by Affordable Solar for the Facebook Utility Solar plants. They were laid off after the projects were completed and may be hired back on as new projects are started. 2 people from the spring 2018 semester were hired in permanent positions at NM Solar Group. There may have been other hirings that I am not aware of.</p> |

| Changes Implemented During the Past Year in Support of Student Learning |
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| <p>Most of the class lecture videos were completed during the last year. That has supported student learning by allowing them to listen and watch the lectures anywhere they have access to internet, on their phones, tablets, or PC computers. They are able to watch and listen multiple times as needed to learn the material. This freed up time in the in person classes for one on one coaching with the students because class time was not taken up with as many lectures. Also a new class was set up for launch in fall of 2018. The class is ELTR 2615 PV Code Compliant Systems. This class will be totally focused on the NEC and will</p> |

support students in learning code requirements for PV in a separate dedicated course. I have been adding this information into the other courses ELTR 2692 and ELTR 2630 which has added extra load to these courses.

PART 3: REPORT ON ASSESSMENT OF STUDENT LEARNING

| Assessment Method | Type of Assessment Tool | Population or Course(s) Assessed | Graduate Learning Outcome(s) Assessed | Mastery Level (E.g., "Minimum score of 3 on a rubric scaled 0-4" or "Minimum score of 75%") | Targeted % Achieving Mastery | Outcome |
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| Labs | Direct & Internal | ELTR 2692 ELTR 2630 | <p>Practice proper job site safety awareness when working on PV system</p> <p>Calculate the size and layout of the array based on system requirements and available area.</p> <p>Use the solar pathfinder to locate the best unshaded array location and determine the solar window for the site.</p> <p>Select the appropriate types of conductors for PV system circuits based on application and environment.</p> <p>Identify and use acceptable PV system grounding methods.</p> | Minimum score of 80% | 80% | Target met |

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| Assignments, Quizzes, Tests | Direct & Internal | <p>ELTR 2620 (Now ELTR 2605)</p> <p>ELTR 2692</p> <p>ELTR 2610</p> <p>ELTR 2630</p> | <p>Demonstrate knowledge of safety awareness of the workplace/jobsite.</p> <p>Identify factors to consider in preliminary assessment such as solar resource, environmental conditions, building code, and utility requirements.</p> <p>Demonstrate knowledge of the primary factors that affect PV system sizing.</p> | Minimum score of 80% | 80% | Target met |
| Assignments, Quizzes, Tests | Direct & Internal | ELTR 2630 | <p>Demonstrate knowledge of structural calculations required in the design of PV systems.</p> <p>Calculate the voltage and current limits for various circuits of a PV system.</p> <p>Select appropriate conductor ampacities and overcurrent protection for various circuits.</p> <p>Determine the system energy and power requirements from a load analysis</p> | Minimum score of 80% | 80% | Target met |

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| Online Software Simulation Tool | Direct & Internal | ELTR 2620 (Now ELTR 2605) | Describe the relationship of energy efficiency to PV installations and identify opportunities for conservation and energy efficiency | Minimum score of 80% | 80% | Target met |
| Labs | Direct & Internal | ELTR 2630 | Demonstrate knowledge of testing and commissioning PV grid-direct systems | Minimum score of 80% | 80% | Target met |
| Discussion Forums | Direct & Internal | ELTR 2620 (Now ELTR 2605) | Demonstrate knowledge of principal types and configurations of PV systems and their uses Describe the relationship of energy efficiency to PV installations and identify opportunities for conservation and energy efficiency | Minimum score of 80% | 80% | Target met |
| Online System Performance and Proposal Tool | Direct & Internal | ELTR 2630 | Calculate the size and layout of array based on system requirements and available area Determine the system energy and power requirement from a load analysis Calculate the critical design parameter based on monthly load and insolation information | Minimum score of 80% | 80% | Target met |

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| Exam | Direct & External | ELTR 2620 (Now ELTR 2605) | <p>Evaluate how array orientation affects solar energy received by modules.</p> <p>Identify methods for determining and diagramming shading patterns.</p> <p>Demonstrate knowledge of the process for determining potential array locations.</p> <p>Identify considerations in determining the suitability and condition of existing roofing, structural systems, and electrical systems and equipment.</p> <p>Practice sizing grid direct systems.</p> <p>Calculate the voltage and current limits for various circuits of a PV system.</p> <p>Determine the system energy and power requirements from a load analysis.</p> <p>Recognize major principles and considerations for designing PV systems with batteries.</p> | Passing Score | 65% | Target partially met |
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Summary of Assessment Findings

80% of the students are meeting the target goals in every assessment except the external industry exam. Rubrics are used in both the theory and lab instruction of the courses. The theory rubric for assignments includes 4 areas: No submission; Improvement required; Competent; and Excellent. The 80% is the competent rubric which includes the work being neatly done with only minor errors, following instructions and completing all required parts, ideas well presented and developed, and some specific examples and detailed descriptions. The rubric for labs includes the same 4 areas. The 80% is the competent which includes questions and/or date is completed, all tasks are completed, all results and/or observations are made, lab reports are neatly written with only minor errors, participation most of the time, and following most directions and procedures. The 20% that are not meeting the 80% mastery in labs, assignments, quizzes, and tests need to be looked at to come up with methods to reach 100% mastery. I also need to assess what I can do to get the external exam pass rate to an 80% at least.

Interpretation of Assessment Findings

The courses use some competency based learning. The courses are set up in modules and the students are required to achieve a 70% or greater in all activities of the module before they can move on. It is my observation that this structure is supporting the students to achieve the 80% mastery that has been set. There are usually 1 to 2 students who have external life situations that impact their learning. It might be health issues, or work related issues, or personal life issues. The results are that they get way behind in the course work and are forced to race through the work at the end. They represent the 10 to 20% who are not meeting the 80% mastery goal. Having all the course work online except the labs makes it easier for these students to get through the course. Having some one on one time with the students seems critical to supporting them through their challenges. If they are not making it into campus to have this one on one time, an idea would be to have online face to face sessions. These courses have a lot of new information to absorb. Repetition is needed to absorb the information. One idea I used in spring of 2018 was to put terms on a beach ball. The ball is thrown around the room. The person holding the ball states the term that is closest to them and describes what it means. This has helped. I want to come up with more ideas like this to do every class session to support their learning and absorption of the material.

Action Plan in Support of Student Learning (Describe changes to be made that are based at least in part on the assessment interpretation. If the assessment did not yield useful information, describe changes to be made in the assessment methodology and/or criteria.)

Action plan to accomplish 100% mastery: Work in time for more one on one interaction in online sessions using Blackboard Collaborate Ultra and in face to face lab classes with students. Use phone apps in class such as Kahoot to give impromptu quizzes for increased repetition of class material. In the face to face classes, have them work in groups on a practice problem and then designate one person from the group to present the solution to the class. Give each group a different problem to work out and share. Have the rest of the class ask questions and give feedback. Continue to work on interactive learning ideas for more repetition and practice with the course material. Fine tune the curriculum assignments, quizzes, tests, and lectures to improve content for better understanding. To improve the test passing rate for the external NABCEP Associates Exam it is going to be critical to do the repetition as discussed. Also there is some critical curriculum that the students need to absorb that we get to at the end of ELTR 2620. I would like to try so restructuring of the curriculum in the spring semester to give them this material earlier in the semester. Also I do give them some study material for the exam, however I would like to make it an assignment with a grade so that there is more incentive to actually complete it.

Please select all of the following that characterize the types of changes described in the above action plan:

- Assessment criteria revision
- Budgetary reallocation
- Curricular Revision
- Assessment methodology revision
- Change in teaching approach
- Faculty training/development
- Assignment revision
- Course content revision
- Process revision

| Recommendations, Proposals, and/or Funding Requests | Budget Needed |
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| None at this time. | Click or tap here to enter text. |

PART 4: REMAINING YEARS IN CURRENT ASSESSMENT CYCLE PLAN (including any revisions) – **OR -- UPCOMING ASSESSMENT CYCLE PLAN** (if this was the final year)

| Years of Full Cycle | Next Year's Assessment Focus (Describe how the next planned assessment is expected to provide information that can be used toward improving student learning.) |
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| 5 years | I plan to reassess each assignment, quiz, test, and activity making notes on the questions that most students miss. That will allow me to make decisions to replace or chance the wording and/or add discussions and added content to the lectures to improve the learning in these areas. |

| Graduate Learning Outcomes to Be Assessed | Years in which Assessment Is Planned | Population/Courses to Be Assessed | Planned Assessment Approach |
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| Practice the proper use of tools. | 4 | ELTR 2692, ELTR 2630 | Labs |
| Install various PV module array systems per local code, manufacturers, and site specifications. | 4 | ELTR 2692, ELTR 2630 | Labs |
| Demonstrate knowledge of assembling fixed, flat ballasted, and tracking racking systems. | 4 | ELTR 2692, ELTR 2630 | Labs |
| Demonstrate knowledge of one and three-line drawings for different PV system configurations. | 4 | ELTR 2692, ELTR 2630 | Labs |
| Identify and use the required types of disconnects and their locations. | 4 | ELTR 2692, ELTR 2630 | Labs |
| Demonstrate knowledge of module specifications and characteristics. | 4 | ELTR 2692, ELTR 2630 | Labs, assignments, quizzes, tests |
| Demonstrate knowledge of basic specifications of batteries and charge controllers. | 4 | ELTR 2692, ELTR 2630 | Labs, assignments, quizzes, tests |
| Demonstrate knowledge of series and parallel wiring. | 4 | ELTR 2692, ELTR 2630 | Labs, assignment, quizzes, tests |
| Demonstrate knowledge of the functions and requirements for electrical balance of system (BOS) components. | 4 | ELTR 2692, ELTR 2630 | Assignments, quizzes, and tests |
| Apply the proper NEC and local codes for installing PV equipment. | 4 | ELTR 2692, ELTR 2630 | Labs |

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| Identify the electrical codes, regulations and practices applicable to PV systems. | 5 | ELTR 2620, ELTR 2630, ELTR 2615 | Quizzes, Discussion Forums |
| Calculate the size and configuration of the battery bank and array based on system requirements. | 5 | ELTR 2630 | Labs, Assignments, Quizzes, Tests |
| Recognize major principles and considerations for designing PV systems with batteries. | 5 | ELTR 2630 | Assignments, Quizzes, Tests |
| Install batteries according to manufacturer's specifications. | 5 | ELTR 2630 | Labs |
| Demonstrate knowledge of testing and commissioning PV grid-direct systems. | 4 and 5 | ELTR 2630 | Labs, Assignments, Quizzes, Tests |
| Demonstrate knowledge of navigating, finding, and understanding sections of the NEC that are critical to installing and inspecting photovoltaic systems | 4 and 5 | ELTR 2615 | Assignments, Quizzes |
| Recognize and identify code compliant, safe selection of components and code compliant, safe installation layouts, and documentation required for photovoltaic systems that are utility interactive with and without energy storage | 5 | ELTR 2615 | Quizzes and Discussion Forums |
| Identify and verify code compliant, safe sizing of conductors and overcurrent protection for DC and AC circuits | 5 | ELTR 2615 | Quizzes |
| Identify and verify code compliant, safe use of wiring methods and selection of the appropriate materials for specific sites and installations. | 5 | ELTR 2615 | Quizzes |
| Demonstrate knowledge of special conditions applicable to PV Systems | 5 | ELTR 2615 | Quizzes |
| Verify code compliant utility interconnections of PV systems | 5 | ELTR 2615 | Quizzes |