SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Electrician Construction Program
Revision Date: August 23, 2021
Syllabus Statements

I. CATALOG DESCRIPTION

Course Number:	ELET1737
Course Title:	PV, Rigging, NEC Calculations
Prerequisite(s):	ELET1736 & ELET1738
Corequisite(s):	ELET1739
Catalog Description:	A complete study of Photovoltaic (PV) systems, the fundamentals of solar radiation, site surveys, modules, arrays and much more. How to size the PV system along with the commissioning, maintenance and troubleshooting of it. How to rig, signal and hoist loads safely and properly. An in-depth study of the calculations used throughout the current NEC. Review key concepts of OCPD's along with protection for motor branch circuits and transformers.
Credit Hours:	4
Class Hours:	45
Lab Hours:	45
Total Contact Hours:	90

II. COURSE OBJECTIVES: *Course will:*

A. Continue to build upon what was learned in course ELET1736 as well as introduce new concepts and work processes.
B. Demonstrate the fundamentals of Photovoltaic (PV) systems.
C. Discuss PV system devices and components used in both commercial and residential applications.
D. Illustrate how to size, commission, maintain and troubleshoot a PV system.
E. Demonstrate safe and proper signaling, rigging and hoisting of loads.
F. Explain how to make calculations for box fill, wire sizing, commercial and residential loads and more as required by the 2020 NEC.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

A. Student Learning Outcomes: *Student will be able to:*
1. Discuss the fundamentals of solar radiation.
2. Demonstrate how to complete a PV site survey with 100% accuracy.
3. Explain the fundamentals of PV devices, modules and arrays.
4. Demonstrate how to install, commission, maintain and troubleshoot a PV system with 100% accuracy.
5. Perform the techniques used to safely and properly hoist a load.
6. Describe the aspects of how to properly plan a lift.
7. Demonstrate the correct signals used to move a load from one spot to another with 100% accuracy.
8. Demonstrate how to calculate the fill for cable trays as per the 2020 NEC with 100% accuracy.
9. Demonstrate how to calculate the ampacity of conductors as per the 2020 NEC with 100% accuracy.

10. Demonstrate how to do voltage drop calculations for residential and commercial loads as per the 2020 NEC with 100% accuracy.
11. Demonstrate how to calculate the size of grounding electrodes and equipment grounding conductors as per the 2020 NEC with 100% accuracy.
12. Recognize the significant changes to the 2020 NEC.
13. Demonstrate how to properly install wire mesh cable tray as per the 2020 NEC with 100% accuracy.
14. Demonstrate how to calculate the available short circuit current with 100% accuracy.
15. Demonstrate how to achieve selective coordination with 100% accuracy.

B. General Education Learning Outcomes (GELOs)
1. GELO #5: Analytical, Quantitative, and Scientific Reasoning
Outcome 3: Effectively develop strategies, algorithms, or experiments (or performing experiments) to better describe the systems or to solve the problems.

IV. CONTENT/TOPICAL OUTLINE

A. SECTION 1
1. Introduction to photovoltaic systems.
2. Fundamentals of solar radiation.
3. Solar radiation data and measurements.
4. Site surveys and planning.
5. Photovoltaic systems and components.
6. Fundamentals of photovoltaic devices.
7. Photovoltaic modules and arrays.
8. Inverters.
9. Electrical integration I.
10. Utility Interconnection.

B. SECTION 2
1. Sun-earth relationships.
2. Batteries.
3. Charge controllers.
4. System sizing.
5. Mechanical integration.
6. Electrical integration II.
7. Permitting and inspection.
8. Commissioning, maintenance and troubleshooting.
9. Economic analysis.

C. SECTION 3
1. Hoisting safety.
2. Cranes.
3. Lift Planning.
4. Signaling.
5. Load weight and balance.
6. Slings and sling hitches.
7. Rigging equipment maintenance.
8. Rigging hardware.
9. Chains and chain slings.
10. Synthetic slings.
11. Wire rope and wire rope slings.
12. Fiber rope and knots.
13. Block and tackle.
14. Hoists.

D. SECTION 4

1. Special occupancies.
2. Electrical equipment.
3. Special equipment.
4. Introduction to cable tray systems.
5. Installing surface metal raceways.
6. Cable tray fills.
7. Ampacity of conductors in cable trays.
8. Electric welders.
9. Determining conductor ampacity.
10. Finalizing ampacity calculations.
11. Performing box size and fill calculations.
12. Calculating raceway fill.
13. Introduction to electrical load calculations.
14. Range and appliance calculations.
15. Calculating the parameters of multifamily dwelling loads in accordance with the NEC.
16. Calculating the parameters of commercial loads in accordance with the NEC.
17. Calculating voltage drop in feeders and branch circuits.
18. Calculating the parameters of residential loads in accordance with the NEC.

E. SECTION 5

1. Installing electric services.
2. Swimming pools, fountains, and similar locations.
3. Understanding emergency system installation requirements.
4. Over 1,000-volt installations.
5. Remote-control, signaling, and power-limited circuits.
6. 2020 NEC changes – Part 1
7. 2020 NEC changes – Part 2
8. Installing wire mesh cable tray (WMCT).
9. Installing surface nonmetallic raceways.
10. In floor installations.
11. Installing multi-outlet assemblies.
12. NEC of solar photovoltaic (PV) systems.
13. Reviewing key OCPD concepts.
14. Motor branch-circuit devices and protection – NEC Article 430.
15. Motor branch circuit and air-conditioning and refrigeration equipment.
16. Transformer Protection – NEC Article 450.
17. Interrupting rating: Fully rating and series rated systems.
18. Equipment short-circuit current protection.
19. Selective coordination.

V. INSTRUCTIONAL MATERIALS

A. Required Text(s): *IBEW Apprentice Guide*

B. Other Resources: Instructor handouts**,** National Electric Code and references available at the Lincoln Electrical Joint Apprenticeship and Training Committee Training Center.

VI. METHODS OF PRESENTATION/INSTRUCTION

A. Methods of presentation typically include a combination of the following:

1. Lecture
2. Discussions
3. Demonstration

VII. METHODS OF EVALUATION

A. Methods of evaluation typically include a combination of the following:

1. Quizzes

2. Tests and exams

VIII. SPECIFIC COURSE REQUIREMENTS

A. The students will maintain an average of 75% (C) or more on the quizzes, tests and exams or the IBEW will drop them from the program.