

Please outline the following for each lesson

# Course Title

## Lesson Title

### SYSTEM INSTALLATION

#### Background

#### Lesson Stage

Introductory/Instructional/or Culminating

*This is a introductory and instructional lesson for developing content and skills.*

#### Intended Audience

Who is the intended audience?

What skills and prior educational experience is required to participate in this lesson?

*Grades (9-14)*

#### Designer's Name & Contact Email

Include this information so instructors have a resource to contact when implementing the lesson.

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#### Goals & Focus

#### General Topic

For example: Wind Energy or Photovoltaic

*Photovoltaic*

#### Central Questions/Overall Purpose/Key Content Ideas Taught in this Lesson

What is a general or central question that the lesson asks?

Provide an overall summary of the lesson objectives

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*Is it important to make sure that a good and effective grounding system is installed for the PV system?*

*What personnel protective equipment is required when working on a roof?*

*Does ground-mounted arrays generally offer less flexibility than building mounted-arrays in the location and orientation of the arrays?*

*Is self-ballasting an attachment method that relies on the weigh of the array, support structure, and ballasting material to hold the array in position?*

**Lesson Duration**

How long will it take to complete the lesson?

6 hours

**Related Learning Standards (if applicable)**

Please refer to any work-based and/or academic learning standards that may apply to this lesson/course.

1.A.01a Identify and apply OSHA and other health and safety regulations that apply to specific tasks.

1.B.o4a Demonstrate safe dress and use of relevant safety gear and PPE.

1.B.10a Demonstrate proper workspace cleaning procedures.

2.A.01c Explain the basic layout of a set of prints as well as the importance of the accompanying job specifications document.

2.B.01 Demonstrate and explain the use of threaded fasteners.

2.B.03 Demonstrate and explain the use and types of anchors.

2.D.01 Explain the basic characteristics of a series, parallel and combination circuit.

2.E.01 Perform measurement of current using the ammeter / clamp-on.

2.E.02 Perform measurement of voltage using the voltmeter.

2.F.06 State appropriate Massachusetts Electrical Code.

2.G.01 Describe various types of cable and raceways.

2.G.06 Explain MEC & NEC raceway requirements.

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## ***Intended Learning Outcomes***

Outcomes should be "SMART"

Specific – Objectives should specify what they want to achieve.

Measurable – You should be able to measure whether you are meeting the objectives or not.

Achievable – Are the objectives you set, achievable and attainable?

*Students will be able to identify the key considerations for integrating arrays on buildings and other structures.*

*Students will understand the key factors involved in choosing a mounting system.*

*Differentiate between various types of mounting configurations and their features.*

*Differentiate between the various types of attachment methods.*

*Compare the various types of structural loads on arrays and the factors that affect each type.*

Realistic – Can you realistically achieve the objectives with the resources you have?

Time – When do you want to achieve the set objectives?

### ***KNOW***

By the end of this lesson students will know...

This may include facts, names, dates, places, information, vocabulary.

*By the end of this lesson students will be able to adequately assist an experience licensed installer.*

### ***UNDERSTAND***

By the end of this lesson students will understand...

This may include big ideas, generalizations, principles, ideas that transfer across situations.

*By the end of this lesson students will understand all of the different terms used in the photovoltaic field for an array installation.*

### ***DO***

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*By the end of this lesson students will identify and understand all essential components to installing a complete PV system.*

....  
*This may include skills of the discipline, social skills, production skills, and processes.*

## **Implementation**

### **Pre-Assessment**

How will you determine students' prior knowledge and understanding for this unit?

What data will you collect?

How will you survey prerequisite learning?

*A verbal pre-assessment will be given to the to evaluate at what of level of understanding they are at .*

### **Resources & Materials**

Attach copies of handouts, slides or visuals required

What equipment is needed to conduct the activities in the lesson?

What do the students need to be able to participate in the lesson?

*Chap 10 of Photovoltaic Systems by American Technical Publishers, Inc. ISBN 978-0-8269-1287-9\*

*Chap. 14 of Photovoltaics Design and Installation Manual ,by Solar Energy International ISBN 978-0-86571-520-2*

### **Activities Plan (Optional)**

Provide as much detail as possible so that an instructor/trainer could use this plan to teach the course.

This may include a step by step action plan, teaching methodologies or types of activities (e.g. group work, lecture, case study, etc)

Each Lesson may have several activities.

For each activity provide a title and identify the duration of the activity.

For each activity outline the steps the instructor will take to complete the activity.

*An actual installation will be made on a mock-up specifically design for training purposes.  
If a roof type trainer is not available a multiple facet alternative energy trainer will be used.*

### **Assessment/Demonstration of Competencies**

## Clean Energy Workforce Training Capacity Building Curriculum Template

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How will the students be assessed on what they have learned?
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*A written test will be given at the end of the module consisting 25 questions (10 true & false, multiple choice and completion type questions.*