



**Course:** **Certificate in Implementing Wind Power Systems for Residential Use**

**Guided Learning Hours: 24**

**Pre-requisite: Basic Science**

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### **Abstract**

This unit provides an overview of the operation and installation of Wind Energy Systems. The importance of energy conservation and renewable sources of energy are emphasized throughout this course with particular attention being placed on the generation of energy from wind sources.

This unit will provide learners with the knowledge to understand the operations, functions and designs of wind powered renewable energies. Learning will take place through a combination of lectures and laboratory sessions.

### **Target Audience**

Individuals and technicians wishing to learn about the installation of wind energy systems.

### **Learning outcomes**

On completion of this course, learners will be able to:

1. Understand the basic principles associated with Wind Energy Systems
2. Understand how energy usage, efficiency and storage affect our everyday life
3. Identify and size the basic components which comprise a wind energy system
4. Design simple Wind Turbine Systems to meet specific energy consumption requirements

## Course Content

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### **1. Understand the basic principles associated with Wind Energy Systems**

Understanding electrical terminology; Definition of wind power; Criteria for efficient operation of wind turbines; Operation of the electrical grid; Operation of generators and turbines; Types of wind turbines; Generator windings; Stand-alone or grid tied systems

### **2. Understand how energy usage, efficiency and storage affect our everyday life**

Green House effect; Sustainability and renewable energy; Environmental impact of wind power; Energy yield predictions

### **3. Identify and size the basic components which comprise a wind energy system**

*Basic components of a wind turbine:* Rotor and blade, charge controller, inverter, guywires, mounting system

*Control systems:* Lift and drag; Pitch and Yaw; Stall control; Cut in cut out speeds

### **4. Design simple Wind Turbine Systems to meet specific energy consumption requirements**

Designing a wind farm; Site considerations; Costing; Collecting and analyzing wind speed data and recognizing errors; Plotting wind speed maps

## Assessment Criteria

In order to achieve Learning Outcome...	The Learner must...
1. Understand the basic principles associated with a Wind Powered Systems.	1.1 Describe the components of a wind powered system. 1.2 Explain how power is generated using a wind turbines. 1.3 Justify the selection of a stand-alone or grid tied wind powered system.
2. Understand how energy usage, efficiency and storage affect the design of Wind Systems	2.1 Determine the energy load requirements for a given site or location 2.2 Perform calculations to properly size a battery bank to meet the storage requirement of a wind system
3. Identify and size the basic components which comprise a wind energy system	3.1 Justify the selection of inverters to meet specific design requirements 3.2 Specify the types of wind turbines 3.3 Estimate the amount of energy produced by a wind powered systems. 3.4 Determine which type of system is best for various settlement locations 3.5 Justify the selection of charge controllers to meet specific design requirements
4. Design simple Wind Turbine Systems to meet specific energy consumption requirements	4.1 Use given wind speed data to forecast available wind power at a given location 4.2 Design a simple Wind System to meet a given energy load demand

### Essential Learning Resources:

Learners will need access to a wide range of publications relating to renewable energy. Various manufacturer products specifications and reference data would also be beneficial to learners. Site visits to Wind system installations and lab sessions would be encouraged during the delivery of this course.

### Textbooks and Manuals

1. Practical Guide to Wind Power by Dan Chiras
2. Lab volt student manual

## Websites

1. [www.alternativeenergy.org](http://www.alternativeenergy.org)
2. <http://windeis.anl.gov/guide/basics/index.cfm>
3. <http://www.energyefficientchoices.com/resources/wind-power-system-sizing-calculator.html>