

# Wind Energy RE-300



## Quick View

- ▶ Provides an overview of wind measurement and advantages of horizontal and vertical axis wind turbines
- ▶ Flexible and Modular Curriculum

## Hands-On Experiments

- ▶ Using Different Wind Scales
- ▶ Operating Hand-held Anemometer
- ▶ Installing a Data Logging Anemometer
- ▶ Collecting and Analyzing Wind Data
- ▶ Interpreting Wind Data Variables
- ▶ Assembling and Operating an Up-wind and Down-wind Horizontal Axis Wind Turbine.
- ▶ Generating and measuring electrical power
- ▶ Calculating Power Based on Air Density, Blade Area, and Wind Speed
- ▶ Predicting Performance By Looking at Turbine Tail Section.
- ▶ Developing a Vertical Axis Wind Turbine

## System Components

- ▶ Textbook
- ▶ Workbook
- ▶ Parts Pack

## Prerequisites

- ▶ Instructor's Guide and Support Manual



The conversion of environmental resources like wind energy is a worldwide quest to saving our natural resources. This eco-friendly alternative to generating electricity has increased in use fivefold globally between 2000 and 2007 according to *Global Wind Energy Council News*.

Wind energy captured by wind turbines connected to electrical grids can provide electricity to both heavily populated areas and isolated locations. Wind energy can also be used to generate mechanical energy for pumping water and other applications.

Wind energy is a renewable energy that is plentiful, clean and widely distributed. This Heathkit Educational Systems Renewable Energy course introduces students to the principles of wind power. Through a series of hands-on experiments, students will learn the fundamentals and applications of this renewable energy, and how it fits in today's real world.



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## Course Objectives

After you complete this course, you will be able to:

- ▶ Understand and use different wind scales.
- ▶ Operate a hand-held anemometer.
- ▶ Locate a good site and then install a data-logging anemometer.
- ▶ Install, set up, and operate Windware software.
- ▶ Collect and analyze wind data.
- ▶ Graph wind data.
- ▶ Understand, interpret, and use important wind data variables.
- ▶ Describe a HAWT wind driven electrical generator.
- ▶ Describe an up-wind HAWT and a down-wind HAWT.
- ▶ List some pros and cons of a HAWT system.
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- ▶ Assemble and operate a HAWT.
- ▶ Generate electricity using a HAWT.

## Course Objectives

(continued)

- ▶ Use a multimeter to measure both voltage and current: output from your HAWT.
- ▶ Calculate power once you know voltage and current.
- ▶ Calculate power once you know air density, blade area, and wind speed.
- ▶ Prepare a graph that visually shows the power generated by a HAWT using various wind speeds.
- ▶ Predict how well a HAWT will perform by observing its tail.
- ▶ Tell the history of the vertical axis wind machines.
- ▶ Understand and describe how a VAWT operates.
- ▶ Assemble and operate a VAWT.
- ▶ Generate electricity by a VAWT.
- ▶ Prepare a graph that visually shows the power generated by a VAWT using various wind speeds.
- ▶ List the pros and cons of a VAWT system.

## Workbook Table Of Contents

- ▶ Introduction
- ▶ Wind and Anemometers
- ▶ Collecting and Analyzing Wind Data
- ▶ The Horizontal Axis Wind Turbine (HAWT) Part 1
- ▶ The Horizontal Axis Wind Turbine (HAWT) Part 2
- ▶ The Vertical Axis Wind Turbine (VAWT)