Fundamentals of Renewable Energy

FESTO

Level 1

This course provides basic concepts of electricity as they apply to renewable-energy (solar and wind). The program emphasizes safe work practices, familiarization with industry representative components, and practical exercises in siting, wiring, charging, storage, and loading for photovoltaic (PV) and wind systems. The students will understand and demonstrate key topics and competencies found in renewable energy systems.

Industry Recognized Certification Topics

- Safety rules, electrical hazards, and a brief history/fundamentals of electricity
- Energy Fundamentals — Basic concepts of electricity
- Locate, identify, and inspect components of a representative solar/wind system
- Solar Unit — PV module siting, components and module characteristics
- Wind Turbine — Wind-turbine basics, components, and characteristics
- Integration of solar and wind systems, Hybrid Renewable Energy Systems (HRES), system level considerations, and sustainability
- Basic Circuit Concepts — Sketching simple circuits, identifying schematic symbols
- Measurement & Instrumentation — Use of measurement techniques for voltage, current, resistance; regulated power supplies
- Comparison of energy sources, data collection, and basic analysis
- Battery Bank / Charging — Battery-bank concepts, charge controllers, charging and storage considerations
- Loading / Practical Applications — creating and testing load circuits and load balancing
- Troubleshooting & Diagnostics — Locating open/short faults, continuity checks, and practical troubleshooting

Units - 6 / Labs - 20

Industry Recognized Certification Competencies

- Follow safety procedures and apply safe working practices when working with electrical systems
- Explain the difference between conductors
- Describe the law of charges
- Differentiate AC and DC and relate these concepts to practical circuits
- Identify and sketch essential circuit components and schematic symbols
- Indicate electron and conventional current flow on circuit diagrams
- Locate, identify, and inspect components of the solar/wind training system and describe their function
- Perform PV module siting tasks and assemble PV module connections
- Operate multimeters and regulated power supplies to measure elements of Ohms law
- Demonstrate practical understanding of energy sources, PV modules, charge controllers, battery banks, and loading scenarios
- Collect and record lab data and interpret basic results
- Configure and test battery bank charging and storage systems, and demonstrate safe connection practices
- Build and test load circuits and verify expected behavior under load
- Troubleshoot typical electrical faults using appropriate diagnostic techniques.