



COLLEGE OF ENGINEERING

SUSTAINABLE & RENEWABLE ENERGY ENGINEERING DEPARTMENT

Sustainable & Renewable Energy Engineering Laboratories

Lab Name	Location	Person in Charge	Programs Served	Courses Served
Fluid Mechanics Lab	M12-013	Rasha Saffarini	- Sustainable & Renewable Energy Engineering	Fluid Mechanics
Wind Energy Lab	M12-013	Rasha Saffarini	- Sustainable & Renewable Energy Engineering	Wind Energy
Heat Transfer Lab	W12-024	Sondus Al-qudah	- Sustainable & Renewable Energy Engineering	Heat Transfer
Energy Storage and Efficiency Lab	W12-110	Monadhel Alchadirchy	- Sustainable & Renewable Energy Engineering	Energy Storage & Transmission Lab
Photovoltaic (PV) Lab	W12-110	Monadhel Alchadirchy	- Sustainable & Renewable Energy Engineering	Solar PV Systems
Solar PV/Wind Energy/Senior Student Projects Lab	W12-301	Monadhel Alchadirchy	- Electrical & Electronics Engineering - Sustainable & Renewable Energy Engineering	- Senior Design Project - Research Project

Sustainable & Renewable Energy Engineering Lab staff

#	Name	Title	Ext.	Email
1	Monadhil Alchaderchi	Lab Engineer	065053491	malchadirchy@sharjah.ac.ae
2	Sondus Al-qudah	Lab Engineer	065053497	salqudah@sharjah.ac.ae
3	Rasha Saffarini	Lab Engineer	065052417	rsaffarini@sharjah.ac.ae

HEAT TRANSFER LABORATORY



Location	Lab Staff in Charge	Contacts
W12-024	Sondus Al-qudah	065053497

INTRODUCTION

Heat Transfer Laboratory offers engineering students the opportunity to learn about Heat Transfer methods and engineering exposure to other related Heat Transfer topics.

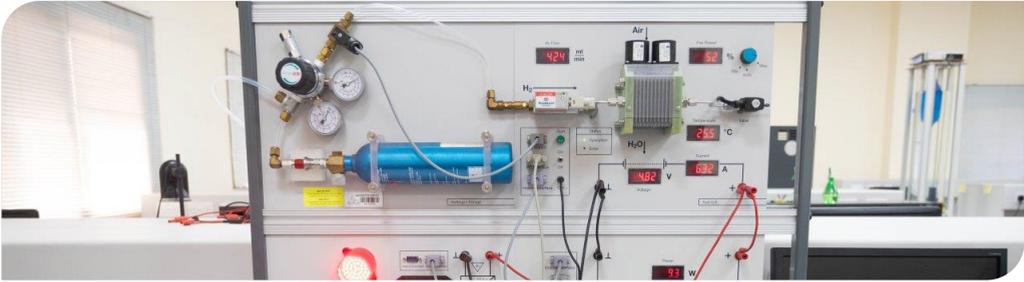
EQUIPMENT AND INSTRUMENTS

- Cross Flow Heat Exchanger Unit
- Unsteady State Heat Transfer Unit
- Boiling Condensing Heat Transfer Unit
- Thermal Conductivity of Fluids Unit
- Natural Convection and Radiation
- Thermo-Electric Heat Pump Unit
- Law of Radiant Heat Transfer Unit
- Forced Convection Heat Transfer Unit
- Free and Forced Convection Unit

EXPERIMENTS

- Thermal Conductivity of Metals, Liquids and Gases
- Heat Conduction Measurements with Boundary and Initial Conditions
- Unsteady (Transient) Heat Conduction
- Boiling and Condensation Heat Transfer
- Analysis of Heat Exchangers
- Radiation Heat Transfer
- Calculation of Emissivity of Different Surfaces
- Experimental Proof of Stefan-Boltzman Law
- Heating Effect Analysis of Thermo-Electric Heat Pump
- Peltier–Effect Analysis
- Free or Natural Convection Heat Transfer
- Heat Transfer by Different Surfaces in Free and Forced Convection
- Forced Convection Heat Transfer

ENERGY STORAGE & EFFICIENCY LABORATORY



Location	Lab Staff in Charge	Contacts
W12-110	Monadhil Alchaderchi	065053491

INTRODUCTION

Energy Storage and Efficiency Laboratory offers students the opportunity to learn about alternate methods of energy storage besides conventional battery banks. The challenge of storing energy, especially from current sustainable and renewable resources is a major one. The efficient storage of this energy is another challenge that will be emphasized and explored.

EQUIPMENT AND INSTRUMENTS

- Latent Energy Storage Setup
- Solar Cell Panel with Battery Storage Setup
- Potentiostat
- Fuel Cell Setup
- Pelton Impulse Turbine Setup
- Computer-Controlled Thermal Solar Energy Unit
- Set of Rechargeable Batteries
- Set of supercapacitors
- Buoyancy Energy Storage Setup
- Compressed Air Energy Storage Setup

EXPERIMENTS

- Characterization and Testing of Rechargeable Battery
- Photovoltaic Solar Energy Storage using Rechargeable Battery
- Energy and Power Analysis of a Polymer Exchange Fuel Cell
- Characterization and Testing of a Supercapacitor
- Latent Heat Energy Storage
- Performance of Solar Water Heat Under Thermosiphon System
- Pelton Impulse Turbine
- Buoyancy Force-Based Energy Storage System
- Performance Analysis of a Compressed Air Energy Storage System

WIND ENERGY LABORATORY



Location	Lab Staff in Charge	Contacts
M12-013	Rasha Saffarini	065052417

INTRODUCTION

Harnessing energy from the wind is a primary source of renewable, sustainable and clean energy. It is essential for an SREE student to be familiar with fundamental concepts of wind energy equipment (wind mills and their design), their efficiency and the maximum possible power generation.

EQUIPMENT AND INSTRUMENTS

- Subsonic Wind Tunnel
- Wind Turbine Performance Setup
- Wind Power Simulator
- Field Test Setup

EXPERIMENTS

- Measurement Lift Force Coefficient for Different Airfoil Shape of Wind Turbine Blade
- Measure Optimum the Angle of Attack and the Lift Force
- Determine the Cut-off Speed of a Wind Turbine
- Collecting Wind Data from Field (Needs Hand Held Equipment Along with Portable Station)
- Optimum Number of Blades
- Investigating Different Curved Blade Shapes
- Turbine Efficiencies
- Tuning for Maximum Power
- Simulation of Wind Energy System Including Integration to Electric Grid
- Vertical Windmill Performance
- Determine the Boundary Layer Over a Flat Plate
- Determine the Pressure Distribution and Calculating the Profile Drag
- Determine the Lift, Drag and Pitching Moment on the Two Different Length Aero-Foils

FLUID MECHANICS LABORATORY



Location	Lab Staff in Charge	Contacts
M12-013	Rasha Saffarini	065052417

INTRODUCTION

The Fluid Mechanics Laboratory experiments are set up so that experiments can be performed to complement the theoretical information taught in the fluid mechanics lecture course. This includes verification of ideas and equations developed in fluid mechanics course, so that the students will have better appreciation for fluid mechanics principles via direct quantitative and phenomenological observation.

EQUIPMENT AND INSTRUMENTS

- Pump Test Apparatus
- Pressure Gauges Calibrator
- Determination of Fluid Properties Apparatus
- Pelton Wheel
- Standard Hydraulic Bench
- Bernoulli's Apparatus
- Center of Pressure Apparatus
- Open Channel-Flow Bench
- Reynolds Apparatus
- Cavitation Demonstration Unit
- Hele-Shaw Apparatus
- Pipe Surge and Water Hammer Apparatus
- Francis Turbine Unit
- Network of Pipe Apparatus
- Viscometer Apparatus
- Friction Losses in Pipes Apparatus
- Hydrostatic Force Apparatus
- Flow Measuring Apparatus

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- Impact of Jets Apparatus
 - Pressure Transducer Apparatus

EXPERIMENTS

- Measurement of Viscosity, Density and Specific Gravity of Fluids
- Fluid Flow Visualizations
- Calibration of Flow Meters
- Calibration of Pressure Gauges
- Velocity and Pressure Measurements
- Flow Types: Laminar Flow, Transition to Turbulence, and Turbulence
- Flow Visualization using Hele-Shaw Setup
- Measurement of Head and Flow Rate Produced by a Pump
- Losses in Pipes and Fittings
- Hydraulic System and Pump Performance
- Open Channel Flow
- Effect of Pipe Surge and Water Hammer
- Cavitation Demonstration and Analysis
- Impact of Jets Analysis
- Verification of Bernoulli's Theorem
- Hydrostatic Forces and Center of Pressure
- Calculation of Efficiency and Braking Power of Turbines
- PipeWork Energy Losses

PHOTOVOLTAIC (PV) LABORATORY



Location	Lab Staff in Charge	Contacts
W12-110	Monadhil Alchaderchi	065053491

INTRODUCTION

This Laboratory introduces students to the concept of converting sunlight to electricity with photovoltaic cells. Students will familiarize themselves with these concepts through conducting a lab activity with measurements and techniques to determine the basic principle of the performance of solar panel and the effect of several variables on the output of photovoltaic panels. Complete photovoltaic system will be analyzed and tested at different conditions with different loads.

EQUIPMENT AND INSTRUMENTS

PHOTOVOLTAIC SOLAR SYSTEMS

- Photovoltaic Solar Panels
- Solar Simulator Formed by Solar Lamps
- DC Load and Battery Charger Regulator
- Auxiliary Battery Charger
- Inverter
- Battery
- AC Loads Module
- Sensors (Temperature, Light Radiation, DC Current and DC Voltage)
- Computer Control System (SCADA)
- Grid Connection Inverter
- Clean Energy Trainer
- Solar Tracking System

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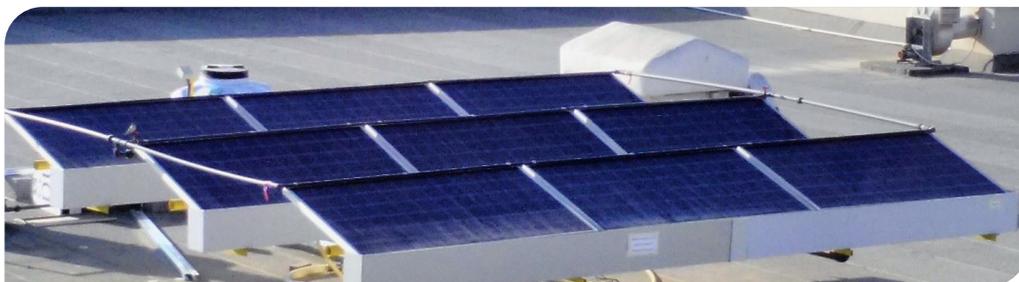
- Peak Power Meter

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- Curve Tracer for PV Modules
 - Generators up to 1000 VDC, 20 A DC, 20 W
 - PV Analyzer (Wireless)

EXPERIMENTS

- Determination of Typical Parameters of Solar Panels
- Study the Relation Between the Generated Power and the Solar Radiation Power
- Determination of the Maximum Power Output of Solar Panels
- Study of the Temperature Influence on Solar Panels Open Circuit Voltage
- Performance Study of Solar Panels Connected in Parallel
- Performance Study of Solar Panels Connected in Series
- Functionality Study of the Parallel/Series Photovoltaic System with Connection of Different Loads and Without Energy Support from the Storage Batteries
- Functionality Study of the Parallel/Series Photovoltaic System with Connection of Different DC-Loads and AC-Loads (Optional Module) with Energy Support from the Storage Batteries
- Study the Effect of Shading on the PV Module
- Analysis of Inverter in Grid-Connected PV System
- Solar Tracking System
- Effects of Distance and Tilt Angle on PV Module Performance

SOLAR PV/WIND ENERGY/SENIOR STUDENT PROJECTS LABORATORY



Location	Lab Staff in Charge	Contacts
W12-301	Monadhil Alchaderchi	065053491

INTRODUCTION

This Laboratory introduces students to the measurements for the electrical parameters for the PV panels by using sophisticated devices, measurements for the sun irradiance, make engineering analysis for the IV curve hybrid system.

EQUIPMENT AND INSTRUMENTS

- profitest
- PV analyzer
- PV panels
- Tracking system
- Shadow ring Pyranometers

EXPERIMENTS

- Shading effects on PV panels (outdoor)
- Characterizations of PV operating outdoor
- Tracking system
- Sun light analysis
- senior projects

TESTS AND SERVICES

- Quality test and analysis