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PDEU PANDIT DEENDAYAL ENERGY UNIVERSITY

Formerly Pandit Deendayal Petroleum University (PDPU)

CENTRE OF EXCELLENCE STATUS BY GOVT. OF GUJARAT

SCHOOL OF ENERGY TECHNOLOGY

Department of Physics

Name of Laboratory : Research Lab

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NAME OF EQUIPMENT :
MBraun Glove Box System

TECHNICAL SPECIFICATIONS :

- **Make:** MBraun (easy proi)
- **Type :** Inert Atmosphere Glove Box System
- **Atmosphere:** High purity N_2 or Ar inert gas environment
- **Oxygen Level:**< 1 ppm
- **Moisture Level (H2O):**< 1 ppm
- Integrated gas purification system
- Pressure control system
- Solvent vapor removal filters
- Real time O2 and H2O sensors
- Built-in circulation and regeneration system
- Suitable for handling air- and moisture-sensitive materials such as perovskites

NAME OF EQUIPMENT :
Thermal Evaporator with Glove Box

TECHNICAL SPECIFICATIONS :

- **Make:** Advanced Process Technology
- **Type :** High Vacuum Thin Film Deposition System
- **Base Pressure:** ~10^{-6} to 10^{-7} Torr
- **Deposition Method:** Thermal evaporation
- **Source Material Holder**: Tungsten / Molybdenum boat or crucible
- **Film Thickness Monitoring:** Quartz Crystal Microbalance (QCM)
- **Deposition Rate:** 0.1 – 10 Å/s
- **Maximum Substrate Size:** 2–4 inch substrates

NAME OF EQUIPMENT :
DC Magnetron Sputtering System

TECHNICAL SPECIFICATIONS :

- **Make:** Hind High vaccum
- **Model**: 12" MSPT
- **Deposition technique:** DC magnetron sputtering (Physical Vapor Deposition – PVD)
- **Base pressure**: ~ 10^{-6}mbar
- **Working pressure:** 10^{-3}– 10^{-2}mbar
- **Power supply:** DC
- **Power range:** 0 – 300 W
- **Operating voltage:** 200 – 600 V
- **Sputtering gas:** High purity argon (Ar)
- **Gas flow control:** Mass Flow Controller (MFC)
- **Target size:** 2–3 inch diameter
- **Substrate temperature:** Room temperature to ~300°C

NAME OF EQUIPMENT :
RF Magnetron Sputtering System

TECHNICAL SPECIFICATIONS :

- **Make:** Hind High vaccum
- **Model**: 12" MSPT
- Typical Vacuum levels:
- Base Vacuum : 10^{-6} to 10^{-7} Torr
- **Deposition technique:** RF magnetron sputtering
- **Working pressure:** 10^{-3} Torr
- **Power range:** 0 – 300 W
- **Sputtering gas:** High purity argon (Ar)

NAME OF EQUIPMENT :
Thermal Evaporator

TECHNICAL SPECIFICATIONS :

- **Make:** RAN-VAC Technologies
- **Type:** Thermal evaporation thin film deposition system (PVD technique)
- **Vacuum Chamber:** Stainless steel chamber with viewing port
- **Base Pressure:** ~ 10-5 to 10-6 Torr
- **Vacuum Pumps:** Rotary pump (backing pump) and diffusion pump for high vacuum
- **Deposition Source:** Tungsten boat / filament for thermal evaporation
- **Power Supply:** High-current DC power supply for heating evaporation source
- **Thickness Monitoring:** Quartz Crystal Monitor (QCM) for film thickness measurement
- **Substrate Holder:** Adjustable holder with provision for small substrates or wafers

NAME OF EQUIPMENT :
Spin Coating System

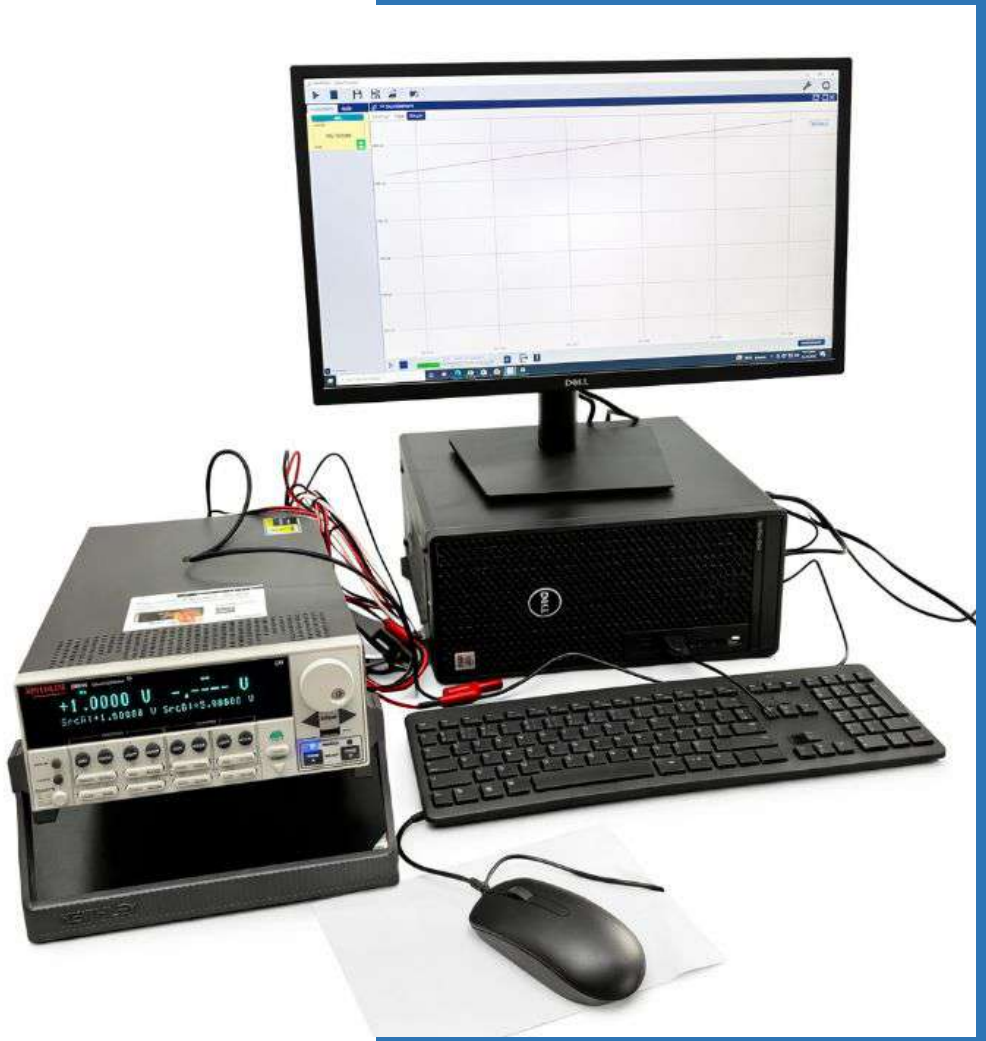
TECHNICAL SPECIFICATIONS :

- **Make:** Apex instruments
- **Model :** Ezspin-A1
- **Type:** Thin Film Coating Equipment
- **Rotation Speed Range:** 500 – 8000 rpm
- **Speed Accuracy:** ±1%
- Programmable multi-step coating profiles
- **Acceleration Range:** 100 – 3000 rpm/s
- Compatible with small substrates (1–4 inch)
- Digital control panel for speed and time programming

NAME OF EQUIPMENT :
Probe Station with Keithley 2604B (Source meter)

TECHNICAL SPECIFICATIONS :

- **Type:** Electrical Characterization Setup
- Keithley 2604B
- **Measurement Mode:** Current–Voltage (I–V) characterization
- **Probe Type:** Two metallic micro probes
- **Voltage Range:** ±10 V to ±100 V (depending on SMU)
- **Current Measurement Range:** pA to mA
- Integrated Source Measure Unit (SMU)
- Probe station with micrometer precision positioning
- Compatible with semiconductor and memristor devices



NAME OF EQUIPMENT :
Solar Thermal Training System

TECHNICAL SPECIFICATIONS :

- **Make:** Ecosense
- **Collector Type :** Flat Plate Solar Collector
- **Collector Dimensions :** 915 mm × 810 mm
- **Absorber Material :** Copper
- **Glazing Type :** Toughened Glass
- **Hot Water Tank :** Non-pressurized storage tank
- **Temperature Measurement :** Multiple temperature sensors with digital meter
- **Flow Measurement :** Flow meter with sensor and flow regulator
- **Measurement Panel :** Centralized real-time display unit
- **Operating Modes :** Thermosyphon and forced circulation

NAME OF EQUIPMENT :
Solar PV Training System

TECHNICAL SPECIFICATIONS :

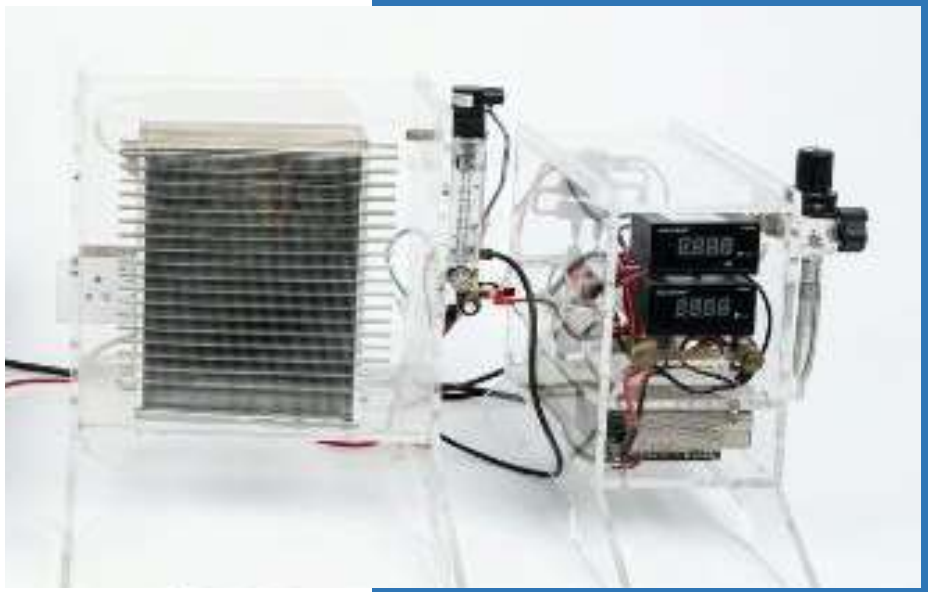
- **Make:** Ecosense
- **PV modules :** two 40Wp Solar panels
- **Artificial Sun with Irradiance Control :** Two lamps illuminating pannels with dimmer for intensity variation
- **Measurement Panel :** Panel Temperature Indicator, DC Voltmeters, DC Ammeters, AC Voltmeters, AC Ammeters
- **Potentiometer :** For tracing V-I Characteristics
- **Loads :** DC Load, AC Load

NAME OF EQUIPMENT :
Pulsed Laser Deposition (PLD)

TECHNICAL SPECIFICATIONS :

- **Make:** RAN-VAC Technologies
- **Lasing material :** Nd-YAG
- **Energy per pulse (mJ) :** >220 mJ @ 1064 nm wavelength.
- **Laser beam diameter (mm) :** 6-8mm
- **Laser beam divergence (m-rad) :** <0.5 mrad
- **Pulse duration (ns) :** 5-7 ns
- **Maximum Laser pulse repetition rate (Hz) :** 10 Hz
- **Jitter (ns) :** < ± 1 ns

NAME OF EQUIPMENT :
Fuel Cell Training System



TECHNICAL SPECIFICATIONS :

- **Make:** Ecosense
- **Type of fuel cell** : PEM
- **Number of cells :** 48
- **Rated Power :** 1000W
- **Performance :** 28.8V @ 35A
- **H2 Supply valve voltage :** 12V
- **Purging valve voltage :** 12V
- **Blower voltage :** 12V
- **Reactants :** Hydrogen and Air
- **Charge Controller :** 1 kW PWM Charge Controller
- **Battery Bank :** 12 V, 26 Ah, 2 Batteries in series
- **Inverter :** 24 V Battery, 1650 VA Home Inverter

NAME OF EQUIPMENT :
UV-VIS Spectrophotometer

TECHNICAL SPECIFICATIONS :

- **Make:** Shimadzu UV-1900i
- **Wavelength Range :** 190 to 1100 nm
- **Light source :** 20-W halogen lamp and deuterium lamp Built-in light source auto position adjustment
- **Detector :** Silicon photodiode
- **Sample compartment :** Internal dimensions: W110 × D250 × H115 mm, Distance between light beams: 100 mm
- **PC compatibility :** LabSolutions UV-Vis software (standard)
- **Display :** 24-bit color touch screen

NAME OF EQUIPMENT :
Magnetic Susceptibility

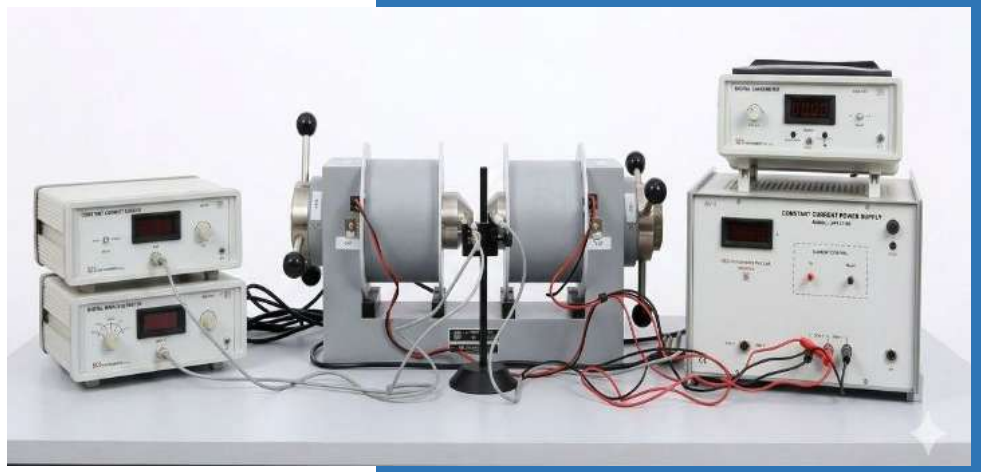
TECHNICAL SPECIFICATIONS :

- **Make:** SES InstrumentsShimadzu UV-1900i
- **Model :** GMX02
- Constant current power supply, DPS-175M
- Digital Gauss meter, DGM-202
- Electromagnet, Model EMU-75T
- Multipurpose Stand(iv) GMX-02 Trolley
- Al. Samples and Glass Tube for powder samples
- Digital Balance, CA-44

NAME OF EQUIPMENT :
Magnetoresistance

TECHNICAL SPECIFICATIONS :

- **Make:** SES Instruments
- **Model :** MRX-01
- Constant Current Power Supply : DPS-50
- **Digital Gaussmeter** : DGM-202
- **Electromagnet :** EMU-50V
- **Magnetoresistance Setup :** DMR-02
- Hall Probe Multipurpose Stand
- **Sample :** Ge crystal (n-type)
- **Four Probe Arrangement :** FPA-MRX-02



NAME OF EQUIPMENT :
Chemical Vapour Diposition (CVD)

TECHNICAL SPECIFICATIONS :

- **Make:** RASAYAN Instruments
- Furnace Type : Two-Zone Tube Furnace
- Heating Zones : 2 independent heating zones
- Maximum Temperature : ~1100 °C – 1200 °C
- Temperature Controller : Digital PID controller
- Heating Element : resistance wire
- Tube Material : Quartz tube
- Power Supply : 220–240 V AC, 50 Hz
- Display : Touch / digital temperature controller

NAME OF EQUIPMENT :
Digital Ultrasonic Cleaner

TECHNICAL SPECIFICATIONS :

- **Make:** Labman
- **Operating principle:** Ultrasonic cavitation
- **Power output:** 100 – 500 W
- **Frequency range:** 20 – 40 kHz
- **Tank capacity:** 2 – 10 L
- **Timer range:** 1 – 60 minutes
- **Temperature control:** Ambient to ~80°C
- **Tank material: Stainless steel**

NAME OF EQUIPMENT :
Digital Magnetic Hotplate Stirrer

TECHNICAL SPECIFICATIONS :

- **Make:** DLAB
- **Model :** MS-H380-Pro
- **Maximum heating temperature :** 380°C
- **Maximum speed :** up to 1500rpm
- **Maximum stirring quantity** of 5L of H2O

NAME OF EQUIPMENT :
Analytical Balance

TECHNICAL SPECIFICATIONS :

- **Make:** Mettler Toledo
- **Model :** ME204
- **Capacity** : 220 g
- **Readability :** 0.1 mg
- convenient device connection via RS232
- internal adjustment

NAME OF EQUIPMENT :
Micro Positioners (Micromanipulators)

TECHNICAL SPECIFICATIONS :

- **Type:** Precision Probe Positioning System
- **Movement Axes:** X–Y–Z translation
- **Positioning Resolution:** ~1–10 µm
- Fine adjustment using micrometre screws
- Compatible with probe stations
- Stable platform for microelectronic device testing

NAME OF EQUIPMENT :
UV–Ozone Cleaning System

TECHNICAL SPECIFICATIONS :

- **Make :** Ossila
- **UV Wavelengths:** 185 nm and 254 nm
- **UV Lamp Power:** ~28–100 W
- **Treatment Area:** Up to 4–6-inch substrates
- **Cleaning Mechanism:** UV-generated ozone oxidation
- **Treatment Time Range:** 1–30 minutes
- Removes organic contaminants and improves surface wettability

NAME OF EQUIPMENT :
Digital Storage Oscilloscope

TECHNICAL SPECIFICATIONS :

- **Make :** Rohde- SchwarzOssila
- **Model :** RTB2004
- **Channel :** 4 Analog, optional 16 Digital (MSO)
- **Bandwidth :** 70 MHz (standard), upgrades to 100/200/300 MHz
- **Sample Rate :** Up to 2.5 GSa/s (1.25 Gsa/s per channel)
- **Vertical Sensitivity:** 1 mV/div to 5 V/div

NAME OF EQUIPMENT :
Function Generator

TECHNICAL SPECIFICATIONS :

- **Make :** Tektronix
- **Model :** AFG1062
- Dual-channel,
- 25 MHz or 60 MHz sine waveforms,
- 12.5 MHz or 30 MHz square waveforms