ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮತ್ತು ವ್ಯವಸ್ಥಾಪನಾ ಮಹಾವಿದ್ಯಾಲಯ
BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT
(Autonomous Institution Under VTU)
Yelahanka, Bengaluru -560119

Sophisticated Research Facilities
at
Center for Advanced Materials Research Lab
Department of Physics



Facilities available

- Thermal evaporation deposition
- Solar simulator AAA Class
- UV photodetector characterization
- Thin Film Thickness Measurement System
- Hall Effect Measurement System
- UV–Visible Spectrophotometer
- Raman spectroscopy
- Fourier transform infrared Spectrometer
- C-H Instruments (electrochemical workstation)
- Dielectric Characterization System
- Muffle Furnace

Thermal evaporation deposition

Thermal evaporation deposition is a physical vapour deposition (PVD) technique used to deposit thin films and electrodes by evaporating materials under high vacuum.



Key Specifications

- **Deposition technique**: Physical vapour deposition (PVD) by thermal evaporation
- **Vacuum level**: Typically **10^6** mbar
- **Heating source**: Resistive heating filament or evaporation boat
- **Source materials**: Suitable metals and evaporative materials
- **Vacuum system:** Rotary pump with high-vacuum pumping stage
- **Deposition thickness**: From a few nanometres to hundreds of nanometres, depending on the material and process

UG/PG students/ Scholars/faculty	**INR 1500 per sample**
Industrial	**INR 2500 per sample**

Solar simulator
I-V characterization system

The FYTRONIX Solar Simulator provides controlled solar illumination for accurate testing of photovoltaic and optoelectronic devices.



Key Specifications

- **Solar Simulator Class:** Class AAA
- **Illumination:** 1000 W/m² (1 Sun)
- **Spectral Match:** Class A
- **Light Source:** Plasma Light
- **Illumination Area:** 50 mm diameter
- **Voltage Range:** −20 to +20 V
- **Current Range:** 50 pA–250 mA
- **Characterization:** I–V, I-t curve, Short-circuit current(Isc), Open-circuit voltage(Voc), maximum power point(Vmax), Current at maximum power(Imax), Fill factor(FF) characterization

UG/PG students/ scholars/faculty	**INR 500 per sample**
Industrial	**INR 800 per sample**

UV photodetector Characterisation

The UV Photodetector Characterization System measures the electrical response of photodetectors, and it is used to determine I–V characteristics, photocurrent, responsivity, rise time, decay time, and detectivity.



Key Specifications

- **Light Source: Xenon Arc Lamp**
- **Test Chamber:** UV Photodetector Chamber
- **Measurement Instrument:** Keithley 2450 Source Meter
- **Voltage Range:** Up to **±200 V**
- **Current Range:** Up to **±1 A**
- **Current Resolution: 10 pA**
- **Voltage Resolution: 10 nV**
- **Maximum Output Power: 20 W**
- **Characterization:** I–V and transient photocurrent (I–t) measurements

UG/PG students/ Scholars/faculty	**INR 500 per sample**
Industrial	**INR 800 per sample**

Thin Film Thickness Measurement System

It is used to measure the thickness of active thin-film materials for optimizing the performance of solar cells, photodetectors, and other optoelectronic devices.



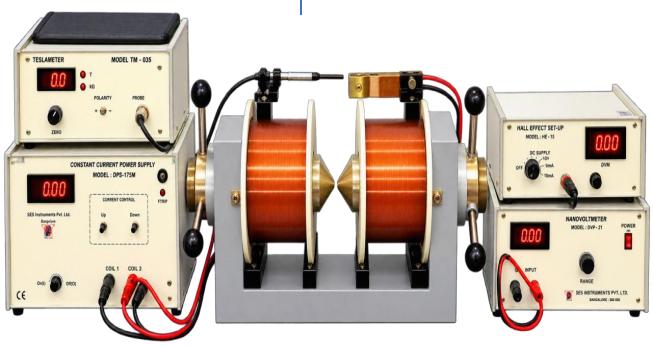
Key Specifications

- **Wavelength Range:** 400–1000 nm
  Film Thickness Range: 10 nm–150 µm
- **Precision / Repeatability:** < 0.01 nm or 0.02%
- **Measurement Spot Size:** < 1 mm (standard)
- **Minimum Data Acquisition Time:** 10 µs
- **Light Source:** 5 W Tungsten-Halogen lamp
  Lifetime: up to 10,000 hours
- **Optional Light Source:** 20 W Tungsten-Halogen lamp
  Application: Thin-film thickness measurement

UG/PG students/ Scholars/faculty	**INR 400 per sample**
Industrial	**INR 600 per sample**

Hall Effect Measurement System

The Hall Effect Measurement Setup is used to characterize the electrical properties of semiconductors and thin films. It measures carrier concentration, mobility, resistivity, conductivity, and carrier type (n-type or p-type).



Key Specifications

- **Type:** Microcontroller-based constant-current power supply
  Current Range: 0–3 A per coil, with a maximum total current of 6 A
- **Magnetic field**: 1Tesla
  Hall Effect → carrier concentration, mobility, carrier type, and resistivity
- **Magnetoresistance** → magnetic-field-dependent transport
- **I–V under magnetic field** → effect of magnetic field on electrical transport
- **Characterisations** → Carrier concentration, mobility measurement, resistivity, and analysis of n-type and p-type semiconductors.

UG/PG students/ Scholars/faculty	**INR 400 per sample**
Industrial	**INR 600 per sample**

UV–Visible Spectrophotometer

UV–Visible spectroscopy is used to determine the optical absorption, band gap, and transmission properties of materials and thin films.



Key Specifications

- **Wavelength Range:** 190–900 nm
- **Optical System:** True Double Beam
- **Spectral Bandwidth:** 0.1–5.0 nm continuously variable
- **Wavelength Accuracy:** ±0.1 nm at 656.1 nm
- **Light Source:** Tungsten Halogen + Deuterium
- **Photometric Modes:** Transmittance, Absorbance & Reflectance
- **Applications:** Thin Films, Powder Samples, Optical Characterization

UG/PG students/ Scholars/faculty	**INR 300 per sample**
Industrial	**INR 500 per sample**

Raman spectroscopy

Raman spectroscopy is a non-destructive characterization technique used to study the molecular vibrations and crystal structure of materials. It helps identify phases, chemical bonding, defects, and structural changes in thin films and semiconductors.



Key Specifications

- **Laser Wavelength:** 785 nm
- **Laser Power:** 5–300 mW
- **Laser Spot Size:** 100 µm
- **Detector:** TE-cooled CCD detector
- **Cooling Temperature**: −20 °C
- **Spectral Resolution**: Approximately 6 cm^{-1}
- **Accumulation Time:** 30 s
- **Sample Types:** Solids, liquids, and powders

UG/PG students/ Scholars/faculty	**INR 500 per sample**
Industrial	**INR 1000 per sample**

Fourier transform infrared(FT-IR) SPECTROMETER

FT-IR is a versatile technique with numerous applications across various scientific disciplines. It's used for identifying unknown materials, Analysing mixtures, and characterizing the functional groups within molecules.



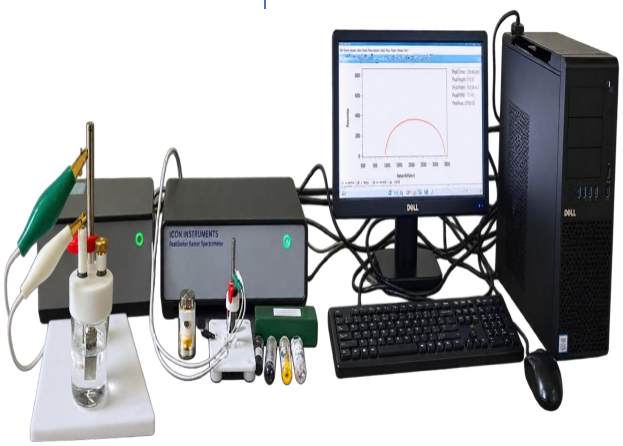
Key Specifications

- **Model Name:** FT-IR Spectrometer ($LiTaO_3$ Detector)
- **Detector Type:** $LiTaO_3$ (Lithium Tantalate)
- **Spectral Range:** 4000–350 cm^{-1}
- **Spectral Resolution:** 0.5 cm^{-1}
- **Optical Window:** KBr, ATR
- **Operating Range:** 5–45 °C
- **Software:** Spectrum 10
- **Sample type:** Solid, liquid, pellets

UG/PG students/ Scholars/faculty	**INR 300 per sample**
Industrial	**INR 500 per sample**

C-H Instruments (electrochemical workstation)

An electrochemical workstation is used to investigate the electrochemical properties of materials and electrodes. It enables measurements such as cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and charge–discharge analysis for batteries, supercapacitors, sensors, and corrosion studies.



Key Specifications

- **Potential Control Range**: ±10 V
- **Current Range**: ±250 mA, measurable down to the pA range
- **Data Acquisition:** Dual-channel synchronous sampling at 1 MHz
- **AC Impedance (EIS):** Frequency range up to 1 MHz.
- **Electrode Configuration**: Supports 2-, 3-, and 4-electrode setups.
- **Applications**: Used for cyclic voltammetry, linear sweep voltammetry, chronoamperometry, electrochemical impedance spectroscopy (EIS), battery and supercapacitor testing

UG/PG students/ Scholars/faculty	**INR 500 per sample**
Industrial	**INR 800 per sample**

Dielectric Characterization System

A high-temperature dielectric measurement system for precise evaluation of dielectric, impedance and electrical properties of materials over a controlled range of temperature and frequency.



Key Specifications

- **Measurement Type**: Dielectric and impedance characterization
- **Temperature Range**: Ambient to ~1000°C
- **Heating Rate**: Approximately 3°C/min
- **Frequency Range**: Approximately 1mHz–5.5 MHz

Characterizations:

- ❖ Dielectric constant (ε′)
- ❖ Dielectric loss (ε″)
- ❖ Loss tangent (tan δ)
- ❖ Impedance spectroscopy
- ❖ AC conductivity

UG/PG students/ Scholars/faculty	**INR 300 per sample**
Industrial	**INR 500 per sample**

Muffle Furnace

A muffle furnace is a high-temperature heating instrument used for heating, calcination, annealing, and heat treatment of materials.



Key Specifications

- **Equipment:** High-Temperature Chamber Furnace
- **Manufacturer:** Delta Power Controls, Bengaluru
- **Maximum Temperature:** up to 1300 °C
- **Temperature Sensor:** R-Type Thermocouple
- **Temperature Control:** Digital temperature controller
- **Heating System:** Electrical resistance heating
- **Type:** Chamber/Box-type furnace
- **Application:** Annealing, calcination, sintering, and heat treatment.

UG/PG students/ Scholars/faculty	**INR 600 per sample**
Industrial	**INR 800 per sample**

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