

## Heat Transfer & Thermal Engineering Lab



### 28 Heat Transfer & Thermal Engineering Lab

The Heat Transfer and Thermal Engineering Lab provides practical exposure to the fundamental principles of heat transfer mechanisms—conduction, convection, and radiation. Students perform experiments to measure thermal properties and study heat exchange in different systems.

## Equipment



### 29. Emissivity Measurement Apparatus

The emissivity apparatus is used to measure the emissivity of a surface by comparing the heat radiated by the surface to a known standard. It allows students to study the heat transfer through radiation and the emissive properties of different materials.

#### Specifications:

**Make:** Datacone Equipment Pvt. Ltd, Sangliwadi, Sangali

**Diameter of Tube:** 38 mm

**Length of Tube:** 500 mm

**Duct Size:** 200 mm x 200 mm x 750 mm

**Temperature Indicator:** 0 to 300°C

**Ammeter:** 0 to 3 A

**Dimmer Stat:** 2 A, 240 V

**Voltmeter:** 0 to 300 V

**Number of Thermocouples:** 07

**Heater:** Cartridge Type – 400 W



### 30. Thermal Conductivity of Metal Bar Apparatus

This apparatus is designed to determine the thermal conductivity of a metal bar by measuring the temperature gradient along its length when subjected to heat. The experiment helps students understand the conduction mechanism in solids.

#### Specifications:

**Make:** Datacone Equipment Pvt. Ltd, Sangliwadi, Sangali

**Length of Metal Bar:** 410 mm

**Size of Metal Bar:** 25 mm

**Test Length of Bar:** 200 mm

**Number of Thermocouples Mounted on Bar:** 09

**Number of Thermocouples Mounted on Insulating Material:** 02

**Heater Coil (Band Type):** Nicrome Heater

**Cooling Water Jacket Diameter:** 80 mm

**Temperature Indicator (Multi-channel):** 0 to 200°C

**Dimmerstat:** 2 A, 230 V

**Voltmeter:** 0 to 300 V

**Ammeter:** 0 to 3 A

**Measuring Flask:** For Water Discharge



**31. Thermal Conductivity of Insulating Material Apparatus**

This apparatus measures the thermal conductivity of insulating materials by assessing the temperature difference of spheres, effectively determining heat transfer properties.

**Specifications:**

**Make:** Datacone Equipment Pvt. Ltd, Sangliwadi, Sangali

**Radius of Inner Sphere (R<sub>i</sub>):** 50 mm

**Radius of Outer Sphere (R<sub>o</sub>):** 100 mm

**Voltmeter:** 0 to 300 V

**Ammeter:** 0 to 3 A

**Temperature Indicator:** 0 to 200°C

**Thermocouples:** Chrome/Aluminium

**Dimmerstat:** 2 A, 230 V

**Heater Coil:** MICA Heater

**Insulating Powder:** Asbestos packed between two copper spheres



**32. Natural and Forced Convection Apparatus**

This apparatus is designed to study the principles of natural and forced convection, allowing for the observation and measurement of heat transfer under varying flow conditions.

**Specification:**

**Make:** Datacone Equipment Pvt. Ltd, Sangliwadi, Sangali

**Diameter of Tube:** 38 mm

**Length of Tube:** 500 mm

**Duct Size:** 200 mm x 200 mm x 750 mm

**Temperature Indicator:** 0 to 300°C

**Ammeter:** 0 to 3 A

**Dimmerstat:** 2 A, 240 V

**Voltmeter:** 0 to 300 V

**Number of Thermocouples:** 7

**Heater:** Cartridge type – 400 W



### 33. Shell & Tube Heat Exchanger

The shell and tube heat exchanger is a widely used heat transfer device that consists of a series of tubes, one set carrying the hot fluid and the other the cold fluid, maximizing thermal efficiency and facilitating heat exchange.

Specifications:

- **Make:** Datacone Equipment Pvt. Ltd, Sangliwadi, Sangali

#### Shell

- **Internal Diameter:** 150 mm
- **Thickness:** 6 mm
- **Baffles:** 2 nos.
- **Passing:** 1.2 pass
- **Length of Shell:** 600 mm

#### Tube

- **Outer Diameter:** 17 mm
- **Inner Diameter:** 13 mm
- **Length:** 600 mm
- **Material Construction:** Mild Steel

#### Rotameter

- **Flow Rate:** 1 to 10 lpm

#### Geysers

- **Power:** 3 kW (2 units)



### **34. Heat Transfer in Forced Convection with inserts**

This setup is a sponsored setup by ASHRAE through ASHRAE Project equipment grant. This is used to study heat transfer enhancement techniques.

Sponsored amount = \$1100

### **List of Experiments**

- Measurement of Thermal Conductivity of metal rod/liquids/insulating powder
- Performance analysis of extended surfaces under free and forced convection.
- Determination of time constant of different materials under unsteady state heat transfer.
- Measurement of heat transfer coefficient flow through tubes in free/forced convection.
- Measurement of emissivity of Grey surface.