COMPUTER AIDED EXPERIMENTAL SETUP FOR ESTIMATION OF HEAT CONDUCTION IN METALS (EE-4100)

DESCRIPTION:

The present Set-up offers basic experiments for targeted teaching on the topic of heat conduction through various metals. To this end, one of eleven specimens is used. The upper region of the specimen is heated by an electrical heater and the lower section cooled by a Peltier element. Heat conduction occurs through the respective specimen from top to bottom. Two specimens can be inserted into the experimental unit at the same time, in order to investigate thermal conductivity through multi-layered metals. Perfectly matched components ensure rapid heating and trouble-free measurements. The temperature of the metal specimens is taken on the top and bottom by means of thermocouples. The microprocessor-based instrumentation is well protected in the housing. The software consists of a software for system operation and for data acquisition and an educational software. With explanatory texts and illustrations the educational software significantly aids the understanding of the theoretical principles.

EXPERIMENTATIONS:

- ➢ To study the transient behaviour of heat conduction and thermal conductivity/resistance of various metallic specimen.
- ➢ To investigate heat transfer in composite system with different specimens connected in series.
- ➢ To examine the influence of specimen length on the overall heat transfer rate and temperature gradient.

TECHNICAL SPECIFICATION:

➢	Peltier Element of cooling cap.	:	50 W (Approx.)
➢	Heater	:	25-30 W
➢	Maxi. Temperature	:	approx. 150ºC
➢	Specimens	:	Material: Copper, Steel, Stainless Steel, Brass, Aluminium
			Lengths: Two sets can be provided
			Possibly 20 mm and 40 mm
			Diameter: 20 mm
			Any additional specimens are also preferred
➢	Measuring Range of Temp.	:	-25 to 300 ºC
➢	Power requirements	:	230V, 50Hz, 1 phase
➢	Data Acquisition	:	USB interfaced and required cables shall be provided

			Compatible with windows OS. Data acquisition system shall feature an integrated microprocessor-based instrumentation, eliminating the need for external measuring devices or error-prone manual wiring
➤	Network capability	:	Capable of connecting multiple external workstations simultaneously via LAN/WLAN for carrying out experiments/observation and evaluation
➤	Software for	:	-System/Setup operation -Data acquisition and recording -Conducting lab experiments and analysis like verifying Lambert's Inverse-Square Law, Stefan-Boltzmann Law, Kirchhoff's Law, transient behavior of thermal systems, power balance to evaluate energy exchange etc. Reporting of results and interpret the plots to provide quantitative analysis.
➤	Study materials requirements	:	multimedia online study E-materials enabled with flexible, self-paced learning. Hardcopy of instructional materials /manuals indicating the setup details/experiments, etc., will be provided. Educational software with structured learning module covering fundamental/advanced topics specific modules for in-depth understanding Equipped with features in the system educational software to allow the instructors to customize the content and integrate the locally developed material into the learning platform
➤	Standard Desktop Computer System for setup	:	Computer system to aid the instructors/students in conducting experiments based on this apparatus Shall have the system/setup software, educational software, etc. Ram: DDR5, 16 GB Storage: 1 TB SSD Processor: Intel Core i7 Input devices: USB mouse and standard keyboard Number of USB ports: Minimum 4 Monitor-LED monitor with 21" screen size Operating system: Windows 11