ME 6460 EXPERIMENTAL TRANSPORT PHENOMENA

1998 Catalog Data: ME 6460. Experimental Transport Phenomena. Lec. 2. Lab 2. Cr. 3.
Review of elementary principles of transport phenomena, data acquisition, and data reduction; measurements of temperature by thermocouples and resistance probes; calculation of heat flux; high temperature optical techniques; differential pressure measurement; volume flow measurements, optical measurement of fluid flow.
Prerequisite: Consent of instructor

Textbook: Lecture notes and published papers

References: E.R.G. Eckert and R.J. Goldstein, Measurements in Heat Transfer, Second Ed.
R.J. Goldstein, Fluid Mechanics Measurements, First Edition

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Goals: To examine current techniques employed in heat transfer and fluid flow measurements, including use of hardware and data reduction techniques. To gain practical laboratory experience in design and implementation of transport measurement systems.

Topics:

1. Thermocouple theory: Laws of thermoelectricity, fabrication and measurement methods, calibration and sources of error
2. Resistance thermometry: RTD probes and thermistors
3. Measurement of gas temperature: Use of thermopiles, conduction errors, radition shielding, measurement of heat and mass transfer coefficients
4. Measurement of surface temperature and heat flux: Slug calorimeters and thin foil gages, calibration and interpretation of results
5. Pytrometry: Total radiation pyrometers, optical pyrometers, fiber-optic probes, effects of gray surfaces and angle of incidence
6. Differential pressure: Static and dynamic pressure, piezoelectric transducers, strain gage transducers
7. Volume flow measurements: Pitot-static tubes, obstruction meters, laminar flow elements, constant temperature and constant current hot-wire anemometers
8. Review of optical techniques: Laser velocimetry, Schliesen systems, Mach-Zender interferometry
9. Measurement of thermal transport properties: Thermal conductivity, viscosity, humidity, combustion products analysis

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