

ME 312: Mechanical Laboratory III (0-0-6:3)

List of Experiments

Thermal Engineering Lab

1. Tubular and Shell and Tube Heat Exchanger: Measuring and plotting the temperature curves in parallel-counter flow, cross parallel-cross counter flow operation, calculation of mean heat transfer coefficient.
2. Test Unit for Free and Forced Convection: Measuring the heat transfer rates, coefficients, efficiencies, Reynolds and Nusselt numbers for free and forced convection through flat plate, pipe bundle and fins.
3. Heat Conduction Study Unit: Determination of thermal conductivity and temperature profile during linear and radial heat conduction.
4. Thermal Radiation Unit: Verifying the Lambert's cosine law; Kirchhoff's laws on absorptivity, reflectivity and emissivity.
5. Heat Conduction in Gases and Liquids: Determination of thermal conductivities of various fluids at different temperatures during steady-state heat conduction in gases and liquids.
6. Vapour Compression Refrigeration Unit: Understanding the operation of key components of a vapour compression refrigeration system (compressor, evaporator, condenser, and expansion element) and the cycle. Performing the energy balance.
7. Vapour Absorption Refrigeration Unit: Studying the basic principle of an absorption refrigeration system under various loads.

Metallographic Lab

1. Study the microstructure of Aluminium reinforced with discontinuous carbon fibres: To study the structure and determine the volume fraction of carbon fibres in the Al-matrix by a) Point count method & b) Image analysis method.
2. Study of microstructure of an annealed mild steel sample: To determination of grain size by a) Lime intercept method b) Image analysis method (Using software KS Grains)
3. Study of the heat affected zone (HAZ) in a welded sample of low carbon steel
4. Studies on the effect quenching and tempering on hardness of the mild steel: To determine the effect of water, oil, sand and air quenching on hardness of the mild steel samples; To determine the effect of tempering temperature on hardness of the mild steel samples; To determine the hardness of a given set of specimens

References:

1. F. P. Incropera and D. P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons.
2. A. Bejan, "Convective Heat Transfer", John Wiley and Sons.
3. C. P. Arora, "Refrigeration and Air Conditioning", Tata McGraw Hill.
4. R. J. Dossat, "Principles of refrigeration", John Wiley and Sons.
5. G.E. Dieter, "Mechanical Metallurgy", McGraw Hill.
6. W. D. Callister, "Material Science and Engineering and Introduction", Wiley.
7. W.F. Smith, "Principles of Materials Science", McGraw Hill.
8. T.V. Rajan, C.P. Sharma and A. Sharma, "Heat Treatments: Principles and Techniques", Prentice Hall