

**BHARATHIAR UNIVERSITY, COIMBATORE – 641 046**

**M.Phil – Applied Mathematics**  
FT/PT Effective from 2008-2009

Paper III - Special Paper

1. Heat Transfer and Magnetohydrodynamics

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**PAPER III**  
**SPECIAL PAPER**  
**HEAT TRANSFER AND MAGNETOHYDRODYNAMICS**

**UNIT I: Flow along surfaces and in channels**

Boundary layer and turbulence – The momentum equation of the boundary layer – The laminar-flow boundary-layer equation - The plane plate in longitudinal flow - Pressure gradients along a surface - Exact solutions of the laminar boundary-layer equations for a flat plate

**UNIT II: Forced Convection in Laminar Flow**

The heat-flow equation of the boundary layer – Laminar boundary-layer energy equation – The plane plate in longitudinal flow – The plane plate with arbitrarily varying wall temperature– Exact solutions of the laminar- boundary- layer energy equation – Flow through a tube.

**UNIT III: Free Convection**

Laminar heat transfer on a vertical plate and horizontal tube – Turbulent heat transfer on a vertical plate – Derivation of the boundary-layer equations – Free convection in a fluid enclosed between two plane walls – Mixed free and forced convection.

**UNIT IV: Introduction and fundamental Equations of Magnetohydrodynamics and Steady Laminar motion**

Introduction and fundamental equations: The electrodynamics moving media- The electromagnetic effects and the magnetic Reynolds number-Alfven's theorem- The magnetic energy-The mechanical Equation-The mechanical effects-The Electromagnetic stresses-Steady Laminar motion.

**UNIT V: Magnetohydrodynamic waves and stability**

Magnetohydrodynamic waves-Waves in an infinite fluid of infinite electrical conductivity-Alfven waves- Magnetohydrodynamic waves in a compressible fluid-Stability-Introduction—Simple illustrative examples-The Method of small Oscillations

**Text book for Units I, II, III**

E.R.G.Eckert & Robert M. Drake, “Heat and Mass Transfer” McGraw-Hill, Tokyo, (1979).

**Textbook for Units IV & V**

V.C.A Ferraro & C. Plumpton, “An Introduction to Magneto-Fluid Mechanics” Clarendon Press, Oxford, (1966).

**Books for Reference:**

1. B. Gebhart, “Heat Transfer”, McGraw-Hill, New York, (1971).
2. H .Schlichting, “Boundary Layer Theory”, Mc Graw Hill, (1979).
3. Alan Jeffrey, “Magnetohydrodynamics”, Oliver & Boyd, London, (1966).

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