JAMES SUCEC, **Heat Transfer.** Simon and Schuster, New York (1975). 604 pp.

"HEAT TRANSFER" by Professor James Sucec is part of the Simon and Schuster Technical Outline series. In fact the book is much more than an outline and would make an ideal undergraduate textbook.

The prerequisite mathematics is no more than first year undergraduate engineering level i.e. an ability to solve ordinary differential equations and some idea of what a partial differential equation is. In the two chapters on conduction (one for steady state and one for transients) the separation of variables method is described in detail. Some special functions occur in these chapters (Bessel and the error function), but a prior knowledge of these functions although desirable is by no means essential. Finite difference methods of solving conduction problems are fully explained including a consideration of numerical stability. The quasi-one dimensional and lumped parameter methods are treated with due emphasis given to ensuring that these approximations are applicable.

The basic concepts involved in radiative heat transfer are clearly presented without reference to quantum mechanics. Three methods of solving radiation problems are described. The reflection method with applications to some simple geometries. The network method in which radiative heat transfer between surfaces is represented by mathematically equivalent electrical networks. Gebhart's absorption factor method where the network method is recast in matrix form. The situation when the emissivity varies with wavelength (non-grey surfaces) is briefly considered.

The requisite fluid mechanics for convective heat transfer is reviewed in considerable detail (about 50 pages). The stress tensor is not discussed and the Navier–Stokes equations are stated without derivation, I think rightly so in a book at this level. However, the velocity distributions for simple fully developed flows are derived from first principles using differential control volumes and Newton's laws of viscous drag and motion. Indeed, throughout the book the use of control volumes and Taylor expansions of flux quantities is emphasised so that a student should become well trained in this fundamental method of deriving the governing equations of physical processes.

Analytical solutions and experimental correlations are given for forced convection in laminar and turbulent flows within tubes and around bodies. Of note are the so called "integral methods" of treating forced convection problems which are explained in the usual easy style of the book. Here the velocity in the boundary layer is approximated by a combination of functions whose weights are obtained using the momentum integral equation, boundary conditions and other compatibility conditions. In a similar fashion it is shown how the temperature in the thermal boundary layer can be obtained utilising an integral formulation of energy conservation. Another useful technique described is Ambrok's method where the flat plate solution is extended to approximate the heat transfer from arbitrarily shaped bodies with varying surface temperatures to flows with varying free stream velocities.

In the chapter on phase change only the gas liquid transition is considered. The absence of a study of freezing is my only criticism of this book. Of course, there are mathematical difficulties with moving boundary problems but the author is content to state solutions and experimental correlations elsewhere (particularly in the free convection chapter).

There are over 500 solved problems and a further 600 supplementary problems. The essential theory sections are tinted grey which is a useful aid to the reader. The British Engineering system of units are used.

This very readable book will be of use to both students and practising engineers. The basic principles of heat transfer are clearly explained and many realistic examples presented without the mathematical analysis ever becoming daunting.

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