

Inverse Problems in Thermal Engineering

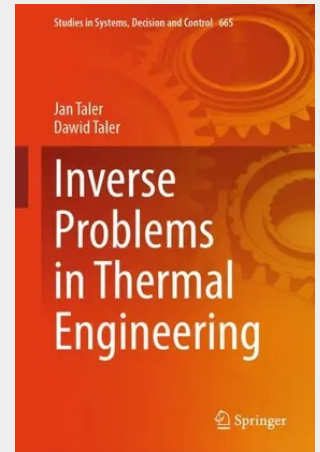
This book presents new methods for solving inverse heat transfer problems occurring in thermal engineering. In the inverse problems analysed in the book, the temperature distribution inside a body or the parameters in the boundary conditions are determined based on temperature measurements at selected points of the body. Analytical and numerical methods for solving inverse heat conduction problems are presented, including the determination of transient thermal stresses in structural elements with simple and complex shapes. Methods for determining thermal stresses on the inner surface of pressure components based on measuring the temperature of the component inside the wall or based on measuring the temperature on an easily accessible, thermally insulated outer surface of the pressure component are presented. Methods for determining the optimum time temperature changes of the fluid in pressure components during heating or cooling are presented, so that the total circumferential stress resulting from pressure and thermal loading is equal to the permissible stress.

A large part of the book is devoted to solving inverse problems in heat exchangers. The following inverse problems were solved: determination of the HTC distribution on the outer surface of a tube in the bundle of a crossflow heat exchanger, determination of the absorbed heat flux, fluid temperature and the HTC on the inner surface of the waterwall tube, simultaneous determination of heat transfer correlations for Nusselt numbers in heat exchangers on both tube wall surfaces, the control of water temperature at the outlet of the plate-fin and tube heat exchanger by changing the fan rotational speed and determination of the number of air fan revolutions based on the measurement of the water temperature at the outlet of the car radiator.

The future time steps, regularisation of the inverse solution and pre-smoothing of measured temperature changes are used throughout the book to reduce the oscillation of the inverse solution over time.

The book is intended for students, academics and researchers, as well as for designers and manufacturers working in the area of thermal engineering.

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