Leis, Rolf

Initial boundary value problems in mathematical physics. (English) Zbl 0599.35001
Stuttgart: B. G. Teubner; Chichester - New York etc.: John Wiley & Sons. VIII, 266 p. DM 62.00; £24.50 (1986).

This attractive text is the outcome of lectures given in Bonn and also at Strathclyde during 1983/84. Its declared purpose is to introduce graduate students of mathematics and physics to the time-dependent theory of the linear partial differential equations of mathematical physics and to classical scattering theory. It succeeds admirably in its aim and will be of real value to such students.

Rather than presenting a completely abstract approach to these topics, the author has chosen to take a middle course by summarising the basic functional analysis required in the second chapter, and thereafter confining detailed discussion to the most important equations of mathematical physics.

The wave equation is considered in chapter 3 and used to formulate initial-boundary value problems, and to prove uniqueness via the spectral theorem. Chapter 4 examines the spectrum of the operator of interest in Chapter 3, starting with bounded domains and then proceeding to exterior domains. Chapters 5 and 6 deal with the free-space problem for the wave equation and the time-asymptotic behaviour of solutions. Linear acoustics and Maxwell's equations form the topics of discussion in Chapters 7 to 9 and the Schrödinger equation in Chapter 10. The last three chapters of the book discuss linear elasticity, the plate equation and linear thermoelasticity.

The writing throughout the book is consise but clear, and the topics covered are of central importance to mathematical physics. The book is to be welcomed as a useful addition to the literature on initial-boundary value problems.

Reviewer: A.Jeffrey

MSC:

35-02	Research exposition (monographs, survey articles) pertaining to partial differential equations
35Q99	Partial differential equations of mathematical physics and other areas of application
35P25	Scattering theory for PDEs
74-02	Research exposition (monographs, survey articles) pertaining to mechanics of deformable solids

Keywords:

wave equation; spectral theorem; spectrum; free-space problem; time- asymptotic behaviour; Linear acoustics; Maxwell's equations; Schrödinger equation; linear elasticity; plate equation; linear thermoelasticity; initial-boundary value problems