1.	Record Nr.	UNINA9910479882503321
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	Titolo	Analytic Methods for Partial Differential Equations [[electronic resource] /] / by G. Evans, J. Blackledge, P. Yardley
	Pubbl/distr/stampa	London : , : Springer London : , : Imprint : Springer, , 1999
	ISBN	1-4471-0379-3
	Edizione	[1st ed. 1999.]
	Descrizione fisica	1 online resource (XII, 316 p.)
	Collana	Springer Undergraduate Mathematics Series, , 1615-2085
	Classificazione	35C15 35A22
	Disciplina	515/.353
	Soggetti	Mathematical analysis Analysis (Mathematics) Numerical analysis Analysis Numerical Analysis
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Note generali	"With 25 Figures."
	Nota di bibliografia	Includes bibliographical references and index.
	Nota di contenuto	1. Mathematical Preliminaries -- 1.1 Introduction -- 1.2 Characteristics and Classification -- 1.3 Orthogonal Functions -- 1.4 Sturm-Liouville Boundary Value Problems -- 1.5 Legendre Polynomials -- 1.6 Bessel Functions -- 1.7 Results from Complex Analysis -- 1.8 Generalised Functions and the Delta Function -- 2. Separation of the Variables -- 2.1 Introduction -- 2.2 The Wave Equation -- 2.3 The Heat Equation -- 2.4 Laplace's Equation -- 2.5 Homogeneous and Non-homogeneous Boundary Conditions -- 2.6 Separation of variables in other coordinate systems -- 3. First-order Equations and Hyperbolic Second-order Equations -- 3.1 Introduction -- 3.2 First-order equations -- 3.3 Introduction to d'Alembert's Method -- 3.4 d'Alembert's General Solution -- 3.5 Characteristics -- 3.6 Semi-infinite Strings -- 4. Integral Transforms -- 4.1 Introduction -- 4.2 Fourier Integrals -- 4.3 Application to the Heat Equation -- 4.4 Fourier Sine and Cosine Transforms -- 4.5 General Fourier Transforms -- 4.6 Laplace transform -- 4.7 Inverting Laplace Transforms -- 4.8 Standard Transforms -- 4.9 Use of Laplace Transforms to Solve Partial Differential Equations -- 5. Green's Functions -- 5.1 Introduction --

5.2 Green's Functions for the Time-independent Wave Equation -- 5.3 Green's Function Solution to the Three-dimensional Inhomogeneous Wave Equation -- 5.4 Green's Function Solutions to the Inhomogeneous Helmholtz and Schrödinger Equations: An Introduction to Scattering Theory -- 5.5 Green's Function Solution to Maxwell's Equations and Time-dependent Problems -- 5.6 Green's Functions and Optics: Kirchhoff Diffraction Theory -- 5.7 Approximation Methods and the Born Series -- 5.8 Green's Function Solution to the Diffusion Equation -- 5.9 Green's Function Solution to the Laplace and Poisson Equations -- 5.10 Discussion -- A. Solutions of Exercises.

Sommario/riassunto	The subject of partial differential equations holds an exciting and special position in mathematics. Partial differential equations were not consciously created as a subject but emerged in the 18th century as ordinary differential equations failed to describe the physical principles being studied. The subject was originally developed by the major names of mathematics, in particular, Leonard Euler and Joseph-Louis Lagrange who studied waves on strings; Daniel Bernoulli and Euler who considered potential theory, with later developments by Adrien-Marie Legendre and Pierre-Simon Laplace; and Joseph Fourier's famous work on series expansions for the heat equation. Many of the greatest advances in modern science have been based on discovering the underlying partial differential equation for the process in question. James Clerk Maxwell, for example, put electricity and magnetism into a unified theory by estab- lishing Maxwell's equations for electromagnetic theory, which gave solutions for problems in radio wave propagation, the diffraction of light and X-ray developments. Schrodinger's equation for quantum mechankal processes at the atomic level leads to experimentally verifiable results which have changed the face of atomic physics and chemistry in the 20th century. In fluid mechanics, the Navier-Stokes' equations form a basis for huge number-crunching activities associated with such widely disparate topics as weather forcasting and the design of supersonic aircraft. Inevitably the study of partial differential equations is a large undertaking, and falls into several areas of mathematics.