

# Équations aux dérivées partielles

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Yue Kuen KWOK. — **Applied complex variables for scientists and engineers.** — Un vol. broché, 15×23, de xi, 392 p. — ISBN 0-521-00462-4. — Prix: £19.95. — Cambridge University Press, Cambridge, 2002.

This is an introduction to complex variable methods for scientists and engineers. It begins by carefully defining complex numbers and analytic functions, and proceeds to give accounts of complex integration, Taylor series, singularities, residues and mappings. Both algebraic and geometric tools are employed to provide the greatest understanding, with many diagrams illustrating the concepts introduced. The emphasis is laid on understanding the use of methods, rather than on rigorous proofs. One feature that will appeal to scientists is the high proportion of the book devoted to applications of the material to physical problems. These include detailed treatments of potential theory, hydrodynamics, electrostatics, gravitation and the uses of the Laplace transform for partial differential equations. The text contains some 300 stimulating exercises of high quality, with solutions given to many of them.

### *Équations différentielles ordinaires*

A. A. MARTYNYUK. — **Qualitative methods in nonlinear dynamics: Novel approaches to Liapunov's matrix functions.** — Pure and applied mathematics, vol. 246. — Un vol. relié, 16×24, de x, 301 p. — ISBN 0-8247-0735-4. — Prix: US\$150.00. — New York, Marcel Dekker, 2002.

This monograph presents new approaches to qualitative analysis of continuous, discrete-time, and impulsive nonlinear systems via Liapunov matrix-valued functions that introduce more effective tests for solving problems of estimating the domains of asymptotic stability. The book discusses innovative methods of initial system decomposition... focuses on exponential polystability of separable motions as well as integral and Lipschitz stabilities... considers problems of dynamics of nonlinear systems in the presence of impulsive perturbations... outlines the comparison principle and advantages of cone-valued Liapunov functions... and more.

### *Équations aux dérivées partielles*

S.N. ANTONTSEV, J.I. DÍAZ, S. SHMAREV. — **Energy methods for free boundary problems: applications to nonlinear PDEs and fluid mechanics.** — Progress in nonlinear differential equations and their applications, vol. 48. — Un vol. relié, 17×24, de xi, 329 p. — ISBN 0-8176-4123-8. — Prix: SFr. 178.00. — Birkhäuser, Boston, 2002.

The theory presented has particular relevance to a number of physical applications, including heat conduction, surface and underground water flow, gas flow, and gas filtration with absorption. The work can be divided into two parts. The first part is an exposition of the methods of several general classes of nonlinear stationary equations and systems, and the second part presents applications to the theory. *Energy Methods for Free Boundary Problems* will appeal to applied mathematicians and graduate students whose research is in partial differential equations, nonlinear analysis, and continuum mechanics. Applications to a number of different problems arising in continuum mechanics (fluid dynamics) are presented making this book of equal interest to physicists and engineers as well.

André MARTINEZ. — **An introduction to semiclassical and microlocal analysis.** — Universitext. — Un vol. relié, 16×24, de viii, 190 p. — ISBN 0-387-95344-2. — Prix: € 69.95. — Springer, New York, 2002.

This book presents most of the techniques used in the microlocal treatment of semiclassical problems coming from quantum physics. Both the standard  $C^\infty$  pseudodifferential calculus and the analytic microlocal analysis are developed in a context that remains intentionally global so that only the relevant difficulties of the theory are encountered. The originality lies in the fact

that the main features of analytic microlocal analysis are derived from a single and elementary a priori estimate. Various exercises illustrate the chief results of each chapter while introducing the reader to further developments of the theory. Applications to the study of the Schrödinger operator are also discussed, to further the understanding of new notions or general results by placing them in the context of quantum mechanics.

Graeme W. MILTON. — **The theory of composites.** — Cambridge monographs on applied and computational mathematics, vol. 6. — Un vol. relié, 25×18, de xxviii, 719 p. — ISBN 0-521-78125-6. — Prix : £60.00. — Cambridge University Press, Cambridge, 2002.

The theory of composite materials is mathematically the study of partial differential equations with rapid oscillations in their coefficients. An explosion of ideas in the last four decades has dramatically increased our understanding of the relationship between the properties of the constituent materials, the underlying microstructure of a composite, and the overall effective moduli that govern the macroscopic behavior. This renaissance has been fueled by the technological need for improving our knowledge base of composites, by the advance of the underlying mathematical theory of homogenization, by the discovery of new variational principles, by the recognition of how important the subject is to solving structural optimization problems, and by the realization of the connection with the mathematical problem of quasiconvexification. This book surveys these exciting developments at the frontier of mathematics and presents many new results.

### *Systemes dynamiques et théorie ergodique*

Arno BERGER. — **Chaos and chance: an introduction to stochastic aspects of dynamics.** — De Gruyter textbook. — Un vol. relié, 18×25, de x, 245 p. — ISBN 3-11-016991-6. — Prix : € 49.95. — Walter de Gruyter, Berlin, 2001.

The book introduces the topologically oriented approach by discussing bifurcations, full and transient chaos, and symbolic dynamics. The statistical point of view is taken via ergodic and mixing properties, entropy, and a thorough discussion of the Frobenius-Perron operator. Markov chains serve as a means of bringing together both viewpoints, and basic concepts of the general dynamics of measures are presented as a concluding outlook. Theory is developed along a host of illustrative examples, with a few prominent examples like billiards serving as navigation beacons throughout. It is also by a number of challenging exercises that the interplay of chaos and chance will be experienced hands-on.

### *Équations aux différences finies, équations fonctionnelles*

B.G. PACHPATTE. — **Inequalities for finite difference equations.** — Pure and applied mathematics, vol. 247. — Un vol. relié, 16×24, de viii, 514 p. — ISBN 0-8247-0657-9. — Prix : US\$ 195.00. — Marcel Dekker, New York, 2002.

Featuring more than 200 references, *Inequalities for Finite Difference Equations* introduces a variety of new finite difference inequalities... discusses perturbations... describes applications to various types of finite difference and sum-difference equations... focuses on stability of finite difference systems... considers inequalities involving iterated sums... examines basic multidimensional finite difference inequalities... identifies bounds on the solutions of difference equations... and more.

### *Analyse de Fourier, analyse harmonique abstraite*

Lokenath DEBNATH. — **Wavelet transforms and their applications.** — Un vol. relié, 17×24, de xv, 565 p. — ISBN 0-8176-4204-8. — Prix : SFr. 158.00. — Birkhäuser, Boston, 2002.

This book presents a systematic exposition of the basic ideas and results of wavelet transforms and their applications in time-frequency signal analysis and turbulence. Wavelets allow