QUARTERLY

OF

APPLIED MATHEMATICS

VOLUME XLIX · DECEMBER · 1991 · NUMBER 4

QUARTERLY OF APPLIED MATHEMATICS

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Second-class postage paid at Providence, Rhode Island.
Publication number 808680 (ISSN 0033-569X).

QUARTERLY

OF

APPLIED MATHEMATICS

VOLUME XLIX 1991

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ERRATA TO QUARTERLY OF APPLIED MATHEMATICS VOLUME XLIX, NUMBER 4, DECEMBER 1991

P. 614, bottom line, should read "the minimum eigenvalue of $\hat{\nabla}\mathbf{u}_2$."
P. 638, bottom line, should read "Continued on page 650".
P. 646, bottom line, should read "proof is completed."
P. 662, bottom line, should read "with".
P. 669, line -1, should read "data would be ... ."
P. 669, bottom line, should read "the proof of ... ."
P. 686, bottom line, should read "Continued on page 794".
P. 702, bottom line, equation number should read "(4.5)".
P. 726, bottom line, should read "$\zeta \in \Delta_D(0)$, ..."
P. 734, line -1, should read "... given functions of the".
P. 742, bottom line, should read "for every $\gamma > 0$."
P. 749, line -1, should read "(1.5) as".
P. 750, line -1, should read "... such that $w'(y_0) = 0$".
P. 781, footnote should read "Received July 6, 1990."
P. 782, line -1, should read "... and the restriction of".
P. 782, bottom line, should read "... two-dimensional variational problem".
P. 790, bottom line, should read "second edge of the shell ... ."
P. 798, line -1, should read "... while $U_A^{(1)}$ represents".

SUGGESTIONS CONCERNING THE PREPARATION OF MANUSCRIPTS FOR THE QUARTERLY OF APPLIED MATHEMATICS

The editors will appreciate the authors' cooperation in taking note of the following directions for the preparation of manuscripts. These directions have been drawn up with a view toward eliminating unnecessary correspondence, avoiding the return of papers for changes, and reducing the charges made for "author's corrections."

Manuscripts: Manuscripts should be typewritten double-spaced on one side only. Marginal instructions to the typesetter should be written in pencil to distinguish them clearly from the body of the text. The author should keep a complete copy.

The papers should be submitted in final form. Only typographical errors should be corrected in proof; composition charges for any major deviations from the manuscript will be passed on to the author.

Titles: The title should be brief but express adequately the subject of the paper. The name and initials of the author should be written as he/she prefers; all titles and degrees or honors will be omitted. The name of the organization with which the author is associated should be given in a separate line following his/her name.

Mathematical Work: As far as possible, formulas should be typewritten; Greek letters and other symbols not available on the average typewriter should be inserted using either instant lettering or by careful insertion in ink. Manuscripts containing pencilled material other than marginal instructions to the typesetter will not be accepted.

The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between zero (0) and the letter O, between the numeral one (1), the letter l and the prime ($'$), between alpha and a, kappa and k, mu and u, nu and v, eta and n.

The level of subscripts, exponents, subscripts to subscripts, and exponents to exponents should be clearly indicated.

Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

Double embellishments are not allowed. These may be replaced by superscripts following the symbols.

Complicated exponents and subscripts should be avoided. Any complicated expression that recurs frequently should be represented by a special symbol.

For exponentials with lengthy or complicated exponents the symbol exp should be used, particularly if such exponentials appear in the body of the text. Thus,

$$\exp[(a^2+b^2)^{1/2}] \text{ is preferable to } e^{[a^2+b^2]^{1/2}}.$$

Fractions in the body of the text and fractions occurring in the numerators or denominators of fractions should be written with the solidus. Thus,

$$\frac{\cos(x/2b)}{\cos(a/2b)} \text{ is preferable to } \frac{\cos\frac{x}{2b}}{\cos\frac{a}{2b}}.$$

In many instances the use of negative exponents permits saving of space. Thus,

$$\int u^{-1}\sin u\,du \text{ is preferable to } \int \frac{\sin u}{u}\,du.$$

Whereas the intended grouping of symbols in handwritten formulas can be made clear by slight variations in spacing, this procedure is not acceptable in typeset formulas. To avoid misunderstanding, the order of symbols should therefore be carefully considered. Thus,

$$(a+bx)\cos t \text{ is preferable to } \cos t(a+bx).$$

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbant quality so that the ink does not spread and produce fuzzy lines. If the figures are intended for reduction, they should be drawn with heavy enough lines so that they do not become flimsy at the desired reduction. The notation should be of professional quality and in proportion for the expected reduction size. Figures which are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

Bibliography: References should be grouped together in a Bibliography at the end of the manuscript. References in text to the Bibliography should be made by numerals between square brackets.

The following examples show the desired arrangements: (*for books*—S. Timoshenko, *Strength of materials*, vol. 2, Macmillan and Co., London, 1931, p. 237; *for periodicals*—Lord Rayleigh, *On the flow of viscous liquids, especially in three dimensions*, Phil. Mag. (5) 36, 354–372 (1893)). Note that the number of the series is not separated by commas from the name of the periodical or the number of the volume.

Authors' initials should precede their names rather than follow them.

In quoted titles of books or papers, capital letters should be used only where the language requires this. Thus, *On the flow of viscous fluids* is preferable to *On the Flow of Viscous Fluids*, but the corresponding German title would have to be rendered as *Über die Stromung zaher Flüssigkeiten*.

Titles of books or papers should be quoted in the original language (with an English translation added in parentheses, if this seems desirable), but only English abbreviations should be used for bibliographical details such as ed., vol., no., chap., p.

Footnotes: As far as possible, footnotes should be avoided. Footnotes containing mathematical formulas are not acceptable.

Abbreviations: Much space can be saved by the use of standard abbreviations such as Eq., Eqs., Fig., Sec., Art., etc. These should be used, however, only if they are followed by a reference number. Thus, "Eq. (25)" is acceptable but not "the preceding Eq." Moreover, if any one of these terms occurs as the first word of a sentence, it should be spelled out.

Special abbreviations should be avoided. Thus "boundary conditions" should always be spelled out and not be abbreviated as "b.c." even if this special abbreviation is defined somewhere in the text.

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Vol. XLIX, No. 4 **December 1991**

Introduction to Applied Numerical Analysis. By Richard W. Hamming. Hemisphere Publishing Corporation, 1988. x+331 pp., $29.95.

This is a reprint of the text originally published by McGraw-Hill in 1971. The author comments in the preface to this edition that in spite of all the improvements in computers, the basics of numerical analysis and the fundamentals common to most of computing have little changed since the original publication of his book, and that there seems little he would, or should, change were he to try to rewrite the book. The text thus remains one of the most accessible of its kind, and characteristic of the didactic skill of this distinguished author.

Manifolds. Tensor Analysis, and Applications. By R. Abraham, J. E. Marsden and T. Ratiu. Springer-Verlag, 1988. vii+654 pp., $59.80.

This is the second edition of Volume 75 in the series Applied Mathematical Sciences, first published in 1983. Its purpose remains to provide core material in nonlinear analysis for mathematicians, physicists, engineers, and mathematical biologists. The main goal is to provide a working knowledge of manifolds, dynamical systems, tensors, and differential forms. Finite and infinite-dimensional manifolds are treated simultaneously for efficiency of exposition. Some applications to Hamiltonian mechanics, fluid mechanics, electromagnetism, plasma dynamics and control theory are given, using both invariant and index notation. The current edition of the book does not deal with Riemannian geometry in much detail, and it does not treat Lie groups, principal bundles, or Morse theory. Some of this is planned for a subsequent edition.

Unimodality, Convexity, and Applications. By Sudhakar Dharmadhikari and Kumar Joag-dev. Academic Press, 1988. xiii+278 pp., $64.50.

This is a volume in the series Probability and Mathematical Statistics. It is its purpose to develop the notion of unimodality as it appears in the field of probability and statistics and to present some of its applications. It is an attempt to bring together the basic notions and tools of the subject for their own sake. The material has been designed so as to be accessible to graduate students. The core material on classes of unimodal distributions on the line and on higher-dimensional spaces is contained in the first two chapters. The third chapter presents generalizations of some of the multivariate results of Chapter 2. Chapter 4 is on the unimodality of discrete distributions and Chapter 5 on that of univariate and multivariate infinitely divisible distributions. The last four chapters consist of applications of unimodality: unimodality and notions of dependence, ordering of distributions by peakedness, applications in statistical inference, convexity in reliability theory.

Mathematical Statistics and Data Analysis. By John A. Rice. Wadsworth & Brooks/Cole, 1988. xix+594 pp., $35.50.

This text is intended for juniors, seniors, and graduate students. The author has tried to write a book closely tied to the practice of statistics, interweaving topics in mathematical statistics (based on likelihood), descriptive statistics and data analysis with special attention to graphical displays, aspects of experimental design, and realistic applications of some complexity. It also reflects the growing use of computers. The book is organised around various kinds of problems that entail the use of statistical methods and includes many real examples to motivate and illustrate the theory. However, the author does not shy away from using the mathematics that the students are supposed to know.

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Numerical Integration III. Edited by H. Brass and G. Hämmerlin. Birkhäuser, Boston, 1988. xiv+325 pp., $60.50.

This is volume 85 in the International Series of Numerical Mathematics. It is the Proceedings of the third symposium on numerical integration, held at Oberwolfach in November 1987. There are 28 papers, several of them on the most urgent problem in the field, integration over multidimensional domains.

Convolution Codes: An Algebraic Approach. By Philippe Piret. The MIT Press, 1988. xiv+339 pp., $40.00.

The author took the algebraic point of view in studying convolutional codes—methods that have already proved useful in the construction and discussion of block codes—because of its efficiency in constructing and analyzing such codes. In particular, it leads to constructions of codes with good error correcting abilities. Chapter headings: 1. Mathematical background. 2. Convolutional encoders; 3. How to choose and use a convolutional encoder; 4. Convolutional codes with automorphisms; 5. When is $\mathrm{Aut}_K(C)$ an infinite group? 6. Further properties of groups, rings, and modules; 7. Structure and decomposition of H-codes; 8. Equivalence between convolutional codes; 9. Semiregular convolutional codes; 11. Convolutional codes that are good for some nonstandard criteria.

New Computer Methods for Global Optimization. By H. Ratschek and J. Rokne. John Wiley & Sons, 1988. iii+229 pp., $49.95.

This is a volume in the Ellis Horwood Series in Mathematics and its Applications. Its scope is twofold. The first aim is to focus on the global problem of optimization and to give precise and computationally reliable instructions on how to organize the relationship between local information and global needs. The second aim is to favor interval methods and to demonstrate that they are excellent tools for handling global optimization problems. Chapter headings: 1. Some principles of optimization theory; 2. Principles of interval analysis; 3. Global unrestrained optimization; 4. Unconstrained optimization over unbounded domains; 5. Constrained optimization.

Flow and Heat Transfer in Rotating-Disk Systems: Volume 1—Rotor-Stator Systems. By J. M. Owens and R. H. Rogers. John Wiley and Sons, 1989. xxiii+278 pp., $84.95.

This is Volume 1 in the Engineering Design Series, Mechanical Engineering Research Studies. The main objects of this monograph are to simplify, unify, and extend the existing work on the subject in order to give research workers and design engineers an understanding of some of the rotating flows that occur inside turbomachinery. After an introductory chapter, Chapter 2 provides the basic equations that are used throughout the book. The elliptic Navier-Stokes and energy equations (and their turbulent equivalents) are reduced to a differential boundary-layer form, and are then converted to integral equations suitable for rotating disc systems. Chapters 3, 4, and 5 deal with flow and heat transfer for a single disc and Chapters 6–9 in rotor-stator systems with or without a superposed flow of fluids.

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Algebraic Theory of Processes. By Matthew Hennessy. The MIT Press, 1988. vi+272 pp., $39.95.

This monograph is the result of a course given at Aarhus University in the spring term of 1985. It presents a semantic theory of communicating processes and a logical proof system for reasoning about them. The approach relies heavily on abstract algebra but the book starts more or less from first principles. It is designed to be self-contained.

Unit Groups of Classical Rings. By Gregory Karpilovsky. Oxford University Press, 1988. xiv+370 pp., $98.00.

The subject matter of this book lies at the crossroads of four areas: ring theory, group theory, group representation theory, and algebraic number theory. The *leitmotiv* of the discussion is given by the author to lie in two problems: given a ring R, determine the isomorphism class of the unit group $U(R)$ of R in terms of natural invariants associated with R; and given a ring R, find an effective method for the construction of units of R.

The Fractal Approach to Heterogeneous Chemistry: Surfaces, Colloids, Polymers. Edited by David Avnir. John Wiley & Sons, 1989. xvii+441 pp., $109.00.

The main purpose of this book is to provide chemists with a comprehensive answer to the question: "What is fractal geometry and what can I do with it in my own research?" The many chapters by several authors are divided into the following five groups: 1. Background (B. B. Mandelbrot, P. Pfeifer and M. Obert); 2. Methods for determining fractal dimension (B. H. Kaye, P. W. Schmidt, P. Evesque); 3. Mechanisms of formation of fractal objects (M. Daoud and J. E. Martin, P. Meakin, M. Matsushita, G. Daccord, H. Van Damme, B. Sapoval, et al.); 4. Processes in fractal environments (S. Havlin, D. Farin and D. Avnir, R. Kopelman, A. Le Melhaute, J. J. Fripiat, P. M. Adler, M. Sernetz, et al., P. A. Burrough, R. Elber).

Regular Variation. By N. H. Bingham, C. M. Goldie, and J. L. Teugels. Cambridge University Press, 1989. xv+494 pp., (paper) $34.50.

This is the first paperback edition of Volume 27 of the Encyclopedia of Mathematics and its Applications, published in 1987. Mathematical and typographical errors have been corrected and there are addenda to some of the chapters and appendices. A supplementary bibliography is also included.

Unsteady Transonic Flow. By Mårten T. Landahl, Cambridge University Press, 1989. x+134 pp., (paper) $17.95.

This is a volume in the series Cambridge Science Classics. First published in 1961, it deals with the analysis of unsteady lift distributions of thin oscillating wings at transonic speeds.

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ABS Projection Algorithms: Mathematical Techniques for Linear and Nonlinear Equations. By Jozsef Abaffy and Emilio Spedicato. John Wiley and Sons, 1989. 220 pp., $59.95.

The name of ABS is given to the class of algorithms discussed here to acknowledge the contributions of J. Abaffy, C. J. Broyden, and E. Spedicato. The ABS algorithm in its basic form computes a solution x^+ of the system $Ax = b$ of m linear equations in n unknowns $(n \geq m)$ as the $(m+1)$th iterate of a sequence of approximations x_i to x^+ having the following property: the approximation x_{i+1} obtained at the ith iteration is a solution of the first i equations. This book presents an approach, based on this algorithm, to the problem of solving linear systems of general form, i.e., determined, undetermined, over-determined, full rank or deficient rank.

Finite Element Approximation for Optimal Shape Design—Theory and Applications. By J. Haslinger and P. Neittaanmäki. John Wiley & Sons, 1989. xi+335 pp., $79.95.

This book is devoted to the mathematical basis of optimal shape design as well as to finite element approximation and to numerical realization by the application of optimization techniques. Its main aim is to investigate optimal design problems via optimal control theory where the states of systems are governed by variational inequalities. The solution of such inequalities does not depend smoothly, in general, on the control, i.e., it is not possible to differentiate the solution of the state problem with respect to the boundary. Hence shape sensitivity analysis is a crucial question, especially in the design of solution procedures, as the objective functional may not be smooth. Chapter headings: 1. Preliminaries; 2. Abstract setting of the optimal shape design problem and its approximation; 3. Optimal shape design of systems governed by a unilateral boundary value state problem—scalar case; 4. Approximation of the optimal shape design problems by finite elements—scalar case; 5. Numerical realization of optimal shape design problems associated with a unilateral boundary value problem—scalar case; 6. Shape optimization in unilateral boundary value problems with a "flux" cost functional; 7. Optimal shape design in contact problems—elastic case; 8. Shape optimization of elastic-perfectly plastic bodies in contact; 9. On the design of the optimal covering supported by an obstacle; 10. State constrained optimal control problems and their approximations; 11. FE-grid optimization; 12. Concluding remarks on references on optimal shape design and related topics.

Topics in Functional Analysis and Applications. By S. Kesavan. John Wiley & Sons, 1989. xii+267 pp., $24.95.

This book aims to provide an introductory course on the functional analytic methods used in the study of partial differential equations. Chapter headings: 1. Distributions; 2. Sobolev spaces; 3. Weak solutions of elliptic boundary value problems; 4. Introduction to semigroups and applications; 5. Some techniques from nonlinear analysis.

Introduction to Geometry. By H. S. M. Coxeter. John Wiley & Sons, 1989. xvi+469 pp., $34.50.

This is the Wiley Classics Library Edition of the second, 1980, edition of this standard treatise.

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Weakly Differentiable Functions: Sobolev Spaces and Functions of Bounded Variation. By William P. Ziemer. Springer-Verlag, 1989. ix+308 pp., $49.00.

This is a volume in the series Graduate Texts in Mathematics. The only prerequisite for it is a standard graduate course in real analysis. The major thrust of the book is the analysis of pointwise behaviour of Sobolev spaces and BV functions. Chapter headings: 1. Preliminaries; 2. Sobolev spaces and their basic properties; 3. Pointwise behaviour of Sobolev functions; 4. Poincaré inequalities—a unified approach; 5. Functions of bounded variation.

Introduction to Queuing Theory. By B. V. Gnedenko and I. N. Kovalenko. Birkhäuser-Boston, Inc., 1989. 312 pp., $59.00.

This is the second edition, revised and supplemented, of Volume 5 of the series Mathematical Modeling, translated from the Russian by Samuel Kotz. The first Russian edition was published in 1969. A new chapter dealing with statistical simulation and material on new qualitative methods was added to this edition. The book remains accessible to an engineer with good mathematical background. Chapter headings: 1. Problems of queuing theory under the simplest assumptions; 2. The study of the incoming customer stream; 3. Some classes of stochastic processes; 4. Semi-Markov models of queueing systems; 5. Application of more general methods; 6. Statistical simulation of systems.

Distributed Parameter Systems: Theory and Applications. By Sigeru Omatu and John H. Seinfeld. Oxford University Press, 1989. xi+430 pp., $95.00.

The goal of this book is to present the major results of both deterministic and stochastic distributed parameter systems (d.p.s.'s) described by partial differential equations in a unified and comprehensive manner. It is intended for applied mathematicians, control theorists, and engineers interested in the field. The twelve chapters are divided into two parts: Part I (Chapters 2-9) treat the mathematical theory, and Part II (Chapters 10–12) is devoted to engineering applications. Chapter headings: 1. Introduction; 2. Some basic results in the theory of partial differential equations; 3. Stochastic partial differential equations; 4. Optimal control of deterministic d.p.s.'s; 5. Controllability and observability; 6. Linear estimation theory; 7. Optimal filter for d.p.s.'s; 8. Stochastic control of d.p.s.'s; 9. Identification of d.p.s.'s; 10. Formal approach to optimal filtering and control of d.p.s.'s; 11. Optimal sensor and actuator location problems; 12. Computational techniques for identification of d.p.s.'s.

Systems of Equations of Composite Type. By A. Dzhuraev. John Wiley & Sons, 1989. xv+333 pp., $126.00.

This is Volume 14 of the Pitman Monographs and Surveys in Pure and Applied Mathematics, being a translation, by H. Begehr and Lin Wei, of the Russian original first published by Nauka, Moscow, in 1972. It is devoted to the theory of a class of singular integral equations on bounded multiply connected domains on the plane and to applications to the theory of general elliptic systems as well as to the corresponding boundary value problems. There are three chapters: 1. Systems of equations of composite type with simple families of real characteristics; 2. Boundary-value problems for composite-type systems of equations with simple families of real characteristics; 3. Boundary-value problems for some systems of equations of composite type with multiple characteristics.

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Engineering Applications of Stochastic Processes: Theory, Problems, and Solutions. By Alexander Zayezdny, Daniel Tabak, and Dov Wulich. John Wiley & Sons, 1989. xvi+509 pp., $128.00.

This is a volume in the Applied and Engineering Mathematics Series, Electronic & Electrical Engineering Research Studies. The purpose of this book is to offer a condensed, systematic presentation of the theoretical and practical basic notions of probabilistic calculations, associated with engineering oriented disciplines, such as electronic communications, radar and automatic control. It consists of two parts. Part I, Random Variables, is an introduction to probability theory; Part II, Random Processes, has the following five chapters: Time, correlation and spectral characteristics of random processes; Additional methods of representation of random signals and processes; Additional methods of description of the probabilistic characteristics of random signals; Linear systems response to random signals.

Elliptic Systems and Quasiconformal Mappings. By Heinrich Renelt, John Wiley & Sons, 1989. vii+146 pp., $36.95.

This volume in the series Pure and Applied Mathematics is a translation of the German original first published as Volume 46 in the series Teubner-Texte zur Mathematik. The main subject of the book is the system of partial differential equations $v_y = au_x + bu_y$, $-v_x = cu_x + du_y$. The author calls their solution generalized analytic functions of the second kind or (ν, μ) solutions. Chapter headings: 0. Auxiliary results from analysis; 1. Quasiconformal mappings and solutions of Beltrami systems; 2. Elliptic systems of partial differential equations of first order in the plane; 3. Some function theoretic properties of (ν, μ) solutions; 4. Integral transformations and fundamental solutions; 5. Integral formulae for (ν, μ) solutions; 6. Variational methods for (ν, μ) solutions.

Introduction to the Mathematics of Quasicrystals. Edited by Marko V. Jaric. Academic Press, 1989. x+226 pp., $59.50.

This is Volume 2 in the series Aperiodicity and Order. It contains the following articles: 1. A brief introduction to tilings, by Marjorie Senechal; 2. Tilings and quasicrystals: a nonlocal growth problem? By R. Penrose; 3. Group theory of icosohedral quasicrystals, by P. Kramer and R. W. Haase; 4. Some local properties of the three-dimensional Penrose tilings; 5. Defects in quasicrystals by J. Bohsung and T.-R. Trebin.

The Asymptotic Solution of Linear Differential Systems—Applications of the Levinson Theorem. By M. S. P. Eastham. Oxford University Press, 1989. x+240 pp., $63.00.

This is Volume 4 of the London Mathematical Society Monographs, New Series. The author refers to a system $Y'(x) = \{\Lambda(x) + R(x)\}Y(x)$ as having the Levinson form if the matrix $\Lambda(x)$ is diagonal and each entry in $R(x)$ has an absolutely convergent infinite integral and he gives the asymptotic solution theory of such systems. The aim of the monograph is to show that many of the asymptotic results can be deduced directly from the Levinson theorem by means of certain well-defined techniques. These techniques involve transformations of the solution vectors of the differential systems, and the author's general theme is to show how the various transformations are used both individually and in combinations.

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Applied Mathematical Ecology. Edited by Simon A. Levin, Thomas G. Hallam, and Louis J. Gross. Springer-Verlag, 1989. xiv+491 pp., $59.50.

This is Volume 18 in the series Biomathematics. It represents the proceedings of the Second Autumn Course on Mathematical Ecology, held at the International Centre for Theoretical Physics in Triesste, Italy, in November and December of 1986. It focused upon applications of mathematical ecology. There is an introductory lecture by Simon A. Levin entitled Ecology in Theory and Applications, followed by 18 papers, divided into the following parts: Resource Management; Epidemiology: fundamental aspects, case studies; Ecotoxicology; Demography and Population Biology.

Electromagnetism. By M. H. Choudhury. John Wiley & Sons, 1989. 640 pp., $149.00.

This is a volume in the Ellis Horwood Library of Physics. It is an outgrowth from a course in electromagnetism which the author has been giving to final-year undergraduates at the University of Hull. It can also be made the basis of a graduate course. A knowledge of vector analysis and advanced calculus is assumed. Chapter headings: 1. Introduction and preliminary survey; 2. Electrostatics; 3. Boundary-value problems in electrostatics; 4. Steady currents; 5. Magnetostatics; 6. Electromagnetic induction; 7. Maxwell's equations and time-varying fields; 8. Electromagnetic wave propagation and plane electromagnetic waves; 9. Waveguides and resonant cavities; 10. Simple radiating systems. Electromagnetic radiation. 11. The special theory of relativity; 12. Relativistic electrodynamics.

Enriques Surfaces I. Edited by Francois R. Cossec and Igor V. Dolgachev. Birkhäuser, Boston, 1989. ix+397 pp.

This is volume 76 of the series Progress in Mathematics. It is the first of two volumes representing the current state of knowledge about Enriques surfaces, which occupy one of the classes in the classification of algebraic surfaces.

Partial Differential Equations and the Calculus of Variation: Essays in Honor of Ennio De Giorgi, in two volumes. Edited by F. Colombini, A. Marino, L. Modica, and S. Spagnolo. Birkhäuser, Boston, 1989. 1018 pp. the two volumes.

These are, respectively, volumes 1 and 2 in the series Progress in Nonlinear Differential Equations and Their Applications. It starts with a conversation with Ennio De Giorgi, and there are 44 papers in all.

Introductory Functional Analysis with Applications. By Erwin Kreyszig. John Wiley & Sons, 1989. xiv+688 pp., $34.50.

This is the Wiley Classics Library Edition of the 1978 text.

Dynamical Systems II: *Ergodic Theory with Applications to Dynamical Systems and Statistical Mechanics.* Edited by Ya. G. Sinai. Springer-Verlag, 1989. vii+281 pp., $59.95.

This is a translation from the Russian of Volume 2 of the Encyclopaedia of Mathematical Sciences of which R. V. Gamkrelidze is editor-in-chief. There are three chapters in this volume, entitled: 1. General ergodic theory of groups of measure preserving transformations; 2. Ergodic theory of smooth dynamical systems; 3. Dynamical systems of statistical mechanics and kinetic equations. Each paper has several chapters with various authors responsible for them.

Fuzzy Control and Fuzzy Systems. By Witold Pedrycz. John Wiley and Sons, 1989. xiv+258 pp., $84.95.

The aim of this book is to study the state-of-the-art of fuzzy sets and their application in control engineering. No assumption of previous knowledge of the subject is made. Chapter headings: Introduction to fuzzy sets; 2. Fuzzy controllers—preliminaries and basic construction; 3. Fuzzy relational equations; 4. Design aspects of the fuzzy controller; 5. Theoretical developments in the construction of fuzzy controllers; 6. Identification of fuzzy models; 7. Prediction and control in fuzzy models; 8. Models of decision-making and some topics of fuzzy arithmetic in setting fuzzy relational equations.

Elementary Stability and Bifurcation Theory. By Gèrard Iooss and Daniel D. Joseph. Springer-Verlag, 1989. xiii+324 pp., $49.95.

This is the second edition of a volume in the series Undergraduate Texts in Mathematics. It is an expanded and simplified revision of the earlier work. The parts relating to the bifurcation of periodic solutions, in Chapters 10 and 11, have been simplified and the treatment made more elementary. Attention is restricted, as in the previous version, to local bifurcation theory, analysis of stability, and branching in the neighbourhood of points of bifurcation. Global methods would require tools from geometry and topology; the book leans more heavily on analysis rather than topology and is basically restricted to analysis near points of bifurcation. Chapter headings: 1. Asymptotic solutions of evolution problems; 2. Bifurcation and stability of steady solutions of evolution equations in one dimension; 3. Imperfection theory and isolated solutions which perturb bifurcation; 4. Stability of steady solutions of evolution equations in two dimensions and n dimensions; 5. bifurcation and steady solutions in two dimensions and the stability of the bifurcating solutions; 6. Methods of projection for general problems of bifurcation into steady solutions; 7. Bifurcation of periodic solutions from steady ones in two dimensions; 8. Bifurcation of periodic solutions in the general case; 9. Subharmonic bifurcation of forced T-periodic solutions; 10. Bifurcation of forced T-periodic solutions into asymptotically quasi-periodic solutions; 11. Secondary subharmonic and asymptotically quasi-periodic bifurcation of periodic solutions in the autonomous case; 12. Stability and bifurcation in conservative systems.

Stochastic Processes. By J. L. Doob. John Wiley & Sons, 1990. vi+654 pp., $32.95.

This is the Wiley Classics Library Edition of the standard treatise first published in 1953.

Mathematical Modeling in Ecology—A Workbook for Students. By Clark Jeffries. Birkhäuser-Boston, Inc., 1989. x+193 pp., $29.95.

This book is devoted to the task of introducing students to the study of deterministic mathematical models of ecosystems and, on the basis of mathematical results on the models, to look for the same patterns or relationships in nature. From this, a student of ecology can learn to express the concept of ecosystem in terms of compartments, systems, and flows. The book should also give the student sufficient background in modeling to understand specific theorems in mathematical ecology. Only elements of calculus and linear algebra are assumed as background.

Mathematical Models for Phase Change Problems. Edited by Jose Francisco Rodrigues. Birkhäuser-Verlag, Basel-Boston, 1989. x+410 pp., $76.00.

This is Volume 88 of the International Series of Numerical Mathematics. It is the Proceedings of the European Workshop held at Opidos, Portugal, October 1–3, 1988. The underlying idea of the workshop was to create and study the mathematical models arising in applied engineering problems with free boundaries in a broad sense, namely in melting and freezing problems, diffusion-reaction processes, solid-solid phase transition, hysteresis phenomena, "mushy region" descriptions, contact problems with friction and/or adhesion, elastoplastic deformations, etc. There are seven papers by various authors.

Computational Fluid Mechanics: Selected Papers. By Alexandre Joel Chorin. Academic Press, 1989. xv+223 pp.

This volume contains 14 papers on computational fluid dynamics written between 1967 and 1982, in particular papers on vortex methods and the projection method, as well as papers on the numerical solution of problems in kinetic theory, combustion theory and gas dynamics. The general theme is the numerical solution of the equations of fluid mechanics when the viscosity is small; the big problem that is looming beyond the specific applications is the problem of turbulence; turbulence is dominated by the mechanics of vorticity, and many of the methods are based on vortex representation of the flow.

Journey Through Genius: The Great Theorems of Mathematics. By William Dunham. John Wiley & Sons, 1990. xiii+300 pp., $19.95.

In this book, the author explores twelve of the most important proofs and ingenious arguments from the history of mathematics, with emphasis on why the theorems were significant and how the mathematician resolved, once and for all, the pressing logical issue. The three primary components in each of the twelve chapters are historical, biographical, and, most importantly, emphasis on the creativity evident in each of these proofs. The chapter headings are: 1. Hippocrates' quadrature of the lune; 2. Euclid's proof of the Phythagorean theorem; 3. Euclid and the infinitude of primes; 4. Archimedes' determination of circular area; 5. Heron's formula for triangular area; 6. Cardano and the solution of the cubic; 7. A gem from Isaac Newton; 8. The Bernoullis and the harmonic series; 9. The extraordinary sums of Leonhard Euler; 10. A sampler of Euler's number theory; 11. The nondenumerability of the continuum; 12. Cantor and the transfinite realm.

Foundations of Discrete Mathematics. By K. D. Joshi. John Wiley & Sons, 1989. xvi+748 pp., $34.95.

This is the first of a set of two texts, the second being called "Applied Discrete Structures." The present book gives the fundamental concepts and techniques of discrete mathematics and a fairly thorough exposure to algebra. The second book is more applications oriented. This text has virtually no prerequisites, and its chapter headings are: 1. Introduction and preliminaries; 2. Elementary counting techniques; 3. Sets with additional structures; 4. Boolean algebra; 5. Group theory; 6. Rings, fields and vector spaces; 7. Advanced counting techniques.

Systems with Impulse Effect: Stability, Theory and Applications. By D. D. Bainov and P. S. Simeonov. John Wiley & Sons, 1989. 255 pp., $79.95.

This is a volume in the Ellis Horwood Series in Mathematics and Its Applications. The theory of systems with impulse effect has close analogies with that of ordinary dynamical systems and the concepts used to analyze stability are generalisations of ideas from dynamical systems theory. The first chapter of this book presents the basic notions and some auxiliary results required later. The second chapter contains results connected with the application of the first method of Lyapunov. The third chapter exploits the direct method of Lyapunov, and introduces specially designed functions analogous to Lyapunov functions. The theory is developed in full analytic rigour, and is illustrated by numerous examples and applications.

Disorder in Physical Systems. Edited by G. R. Grimmett and D. J. A. Welsh. Oxford University Press, 1990. x+378 pp., $75.00.

This is a volume in honour of John M. Hammersley on the occasion of his 70th birthday. Hammersley was a pioneer in many fields, but in particular in the study of random processes in space. The principal theme of this volume reflects various aspects of his work in the area, including disordered media, subadditivity, numerical methods, and the like. It leads off with David Kendall's splendid speech proposing the toast of John Hammersley, and there are 21 papers.

Structural Optimization: Volume 2—Mathematical Programming. By A. Borkowski and S. Jendo, edited by M. Save and W. Prager. Plenum Press, 1990. ix+397 pp., $75.00.

This volume, Number 40 in the series Mathematical Concepts and Methods in Science and Engineering, contains the following papers, each by one of the authors (numbered consecutively with the first volume): 10. Elements of mathematical programming; 11. Matrix modeling of a structure; 12. Optimization of elastic structures; 13. Optimization of plastic structures; 14. Optimization of plates and shells (this chapter is written by Mark Reitman); 15. Optimal design of elastic frame structures; 16. Geometric programming; 17. Dynamic programming; 18. Multiobjective optimization; 19. Other optimal design methods. There is also an extensive bibliography. The third volume will apply the methods developed here to problems of practical optimal design of metal and concrete structures.