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BOOK REVIEWS

MITROPOLSKII, YU.; KHOMA, G.; GROMYAK, M. – *Asymptotic Methods for Investigating Quasiwave Equations of Hyperbolic Type*, Mathematics and Its Applications, vol. 402, Kluwer Academic Publishers, Dordrecht-Boston-London, 1997, x+206pp., ISBN 0-7923-4529-0.

The theory of partial differential equations is a wide and rapidly developing branch of contemporary mathematics.

Cauchy problems for hyperbolic equations and systems with variable coefficients have been studied in classical works of *Petrovskii, Leret, Courant, Gording.* Mixed problems for hyperbolic equations were considered by Vishik, Ladyzhenskaya, and that for general two-dimensional equations were investigated by *Bitadze, Vishik, Gol'dberg, Ladyzhenskaya, Myshkin,* and others.

As known, the solvability problem for periodic boundary value problem belongs to the basic problems in the theory of nonlinear hyperbolic equations. The development of the theory of boundary value problems for both ordinary and partial differential equations is prompted first of all by the practical needs with regard to solving various problems in physics, celestial mechanics, radio-and electrical engineering, etc.

There are two major approach the asymptotic methods of nonlinear mechanics to investigated nonlinear wave partial differential equations, which describe distributed parameter systems.

The first approach uses reduction of a boundary value problem to a countable system of ordinary differential equations with the help of Fourier series.

The second approach builds up asymptotic expansions of solutions of boundary value problems.

The present book is devoted to further development of the asymptotic theory of investigation of solutions of second order partial differential equations of hyperbolic type.

The authors develop a new research direction in the theory of constructive numerical methods for studying solutions of a wide classes of periodic boundary value problems for both wave ordinary differential equations of

second order and wave equations of hyperbolic type. Also, the authors suggest and justify a systematic approach to constructing and applying asymptotic methods for studying solutions of boundary value problems for nonlinear wave partial differential equations with small parameter.

This monograph provides a very well organized and clearly presented material with many results that belong to the authors.

An extensive bibliography, an index and the preliminary remarks of each chapter further help the reader to quickly find the information he that needs.

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PANKOV, ALEXANDER – *G-Convergence and Homogenization of Nonlinear Partial Differential Operators*, Mathematics and Its Applications, vol. 422, Kluwer Academic Publishers, Dordrecht-Boston-London, 1997, vii+249pp., ISBN 0-7923-4720-X.

Various applications of the homogenization theory of partial differential equations resulted in the further development of this branch of mathematics, attracting an increasing interest of both mathematicians and experts in other fields. The present book is devoted to *strong G-convergence* of nonlinear divergence form elliptic and parabolic operators, and applications to homogenization problems proper for periodic, almost periodic, and random homogeneous operators of such kind.

The core of the book is Chapter 2, in which we study in detail strong G-convergence of nonlinear elliptic operators. We consider both the case of *monotone multivalued*, and *pseudomonotone single-valued operators.* These are treated separately in order to present different approaches. Beside general properties, like strong G-compactness, localization property, and convergence of arbitrary solutions, being essentially common for both cases under consideration, we discuss, in Section 2.4, some additional results which seem to be specific for the single-valued case only. Interesting in themselves these last results provide useful tools for the study of the almost periodic homogenization problem.

Next, in Chapter 3 are presented nonlinear elliptic homogenization problems. The results have a statistical character, i.e. homogenization takes place for almost all realizations (almost surely).

Chapter 4 deals with strong G-convergence and homogenization of nonlinear parabolic operators.

The main body of the monograph is supplemented by two Appendices. In the first one a version of the homogenization theorem of difference schemes is outlined, while in the second are given some open problems.

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ANTREICH, K.; BULIRSCH, R.; GILG, A.; RENTROP. P. (Eds.) – *Modelling, Simulation, and Optimization of Integrated Circuits*, Proceedings of a Conference held at the Mathematisches Forschungsinstitut, Oberwolfach, November 25-December 1, Birkhäuser Verlag, Basel-Boston-Berlin, 2001, XII+360pp., CHF 186.-/EUR 118.-, ISBN 3-7643-2192-X.

Numerical simulations often replace time consuming and expensive experiments in chip industry. Instead of real objects, physical or mathematical models are studied, and the simulation of processes, devices, circuits and equipments is a central focus.

During the last decade the Mathematical Research Centre at Oberwolfach, Germany, has hosted three Conferences on the topic Mathematical Models and Numerical Simulation in Electronic Industry. The two Proceedings conferences in 1988 and 1992-the Proceedings have been published in this series ISNM 93 (1990) und ISNM 117 (1994)- concentrated more on device and process simulation.

In november 2001 the Mathematical Research Center at Oberwolfach, Germany, hosted the third Conference on Mathematical Models and Numerical Simulation in Electronic Industry. It brought together researchers in mathematics and electrical engineering, and scientists working in industry. The contributions to this volume try to bridge the gap between basic and applied mathematics, research in electrical engineering, and the needs of industry.

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LIMNIOS, N.; OPRIŞAN, G. – *Semi-Markov Processes and Reliability,* Statistics for Industry and Technology, Birkhäuser Verlag, Boston-Basel-Berlin, 2001, IX+240pp., ISBN 0-8176-4196-3.

Procesele stochastice semi-Markov au fost introduse de către P. Lévy şi W.L. Smith în cadrul Congresului internaţional al matematicienilor, care a avut loc la Amsterdam în anul 1954. Această clasă de procese stochastice reprezintă o generalizare a proceselor Markov şi de reînnoire. Necesitatea studiului proceselor semi-Markov a fost impusă de probleme practice privind fiabilitatea sistemelor complexe, în ipoteza existenţei fenomenului de uzură în timp a componentelor lor.

Conţinutul cărţii este divizat în 6 capitole şi 3 anexe. În capitolul 1 sunt definite noţiunile de proces stochastic, proces de ordinul doi, proces şi lanţ Markov, proces de reînnoire şi proces Gaussian. Capitolul 2 prezintă cadrul proceselor Markov de reînnoire, cu spaţiul stărilor arbitrar, folosind nucleele semi-Markov şi convoluţiile de funcţii matriciale. Prezentarea detaliată

a proceselor semi-Markov, împreună cu alte procese stochastice legate de acestea, este făcută în capitolul 3. În capitolul 4 sunt prezentate procesele semi-Markov cu spaţiul stărilor cel mult numărabil. Capitolul 5 constituie o introducere în utilizarea proceselor semi-Markov la estimarea fiabilităţii sistemelor. În capitolul 6 sunt prezentaţi câţiva alogoritmi de simulare pentru o mulţime de probleme privind fiabilitatea diferitelor tipuri de sisteme. Cartea de încheie cu 3 anexe intitulate: Măsură şi probabilitate, Transformata Laplace-Stieltjes, Convergenţa slabă, o bibliografie, o listă de notaţii şi un indice.

Prin conţinutul său teoretic şi aplicativ, această carte poate fi utilă cercetătorilor din domeniul proceselor stochastice cât şi inginerilor preocupaţi de modelare stochastică a funcţionării sistemelor complexe, în ipoteza existenţei fenomenului de uzură.

E. Nenciu

SHEIN-CHUNG, CHOW; IUN, SHAO – *Statistics in Drua Research: Methodologies and Recent Developments,* Biostatistics: A Series of References and Textbooks, vol. 10, Marcel Dekker, Inc., New York-Basel, 2002, XIV+367pp., ISBN 0-8247-0763-X.

Scopul volumului constă în prezentarea sistematică şi unificată a metodologiilor statistice clasice şi recente folosite în procesul producerii de medicamente. Acest proces continuu şi de durată, presupune parcugerea fazelor neclinică, preclinică şi clinică. Utilizarea conceptelor şi metodologiilor statistice permite demonstrarea ştiinţifică a calităţii, fiabilităţii şi eficienţei în cercetarea şi dezvoltarea farmaceutică.

Cele 12 capitole ale cărţii tratează subiecte ca: validarea farmaceutică, testarea disoluţiei, bioechivalenţa, analiza stabilităţii, randomizarea, analiza datelor incomplete, meta-analiza, calitatea vieţii şi imaginea medicală. Pentru înţelegrea conţinutului acestui volum este necesară o bună cunoaştere a următoarelor capitole de statistică matematică: planificarea experimentelor, testarea ipotezelor statistice, intervale şi regiuni de încredere, analiza datelor, regresia şi analiza Bayesiană. Conceptele şi metodologiile utilizate sunt ilustrate prin numeroase exemple reale. Cartea se încheie cu o bibliografie şi un indice de subiecte.

Acest volum poate fi folosit de către biostatisticieni şi cercetători interesaţi în descoperirea şi producerea de medicamente.

E. Nenciu

COHEN, JOEL E.; KEMPERMAN, J.H.B.; ZBAGANU, GH. – *Comparisons of Stochastic Matrices with Applications in Information Theory,* Statistics, Economics, and Population Sciences, Birkhäuser Verlag, Boston-Basel-Berlin, 1998, VIII+158pp., ISBN 0-8176-4082-7.

Conţinutul acestui volum este divizat în două părţi. Prima parte este destinată prezentării elementare a unor rezultate privind matricile stochastice de dimensiuni finite. Partea a doua conţine generalizări ale rezultatelor din prima parte, prin intermediul nucleelor Markov între două spaţii măsurabile. Conceptul fundamental cu care se operează în această carte este cel de canal, prin care se înţelege o familie finită şi ordonată de măsuri de probabilitate. Asociind fiecărui canal o matrice stochastică, compararea perfomanţelor canalelor revine la compararea matricilor stochastice asociate.

Prima parte, intitulată "Comportarea matricilor stochastice prin relaţii de ordine parţială", este divizată în 7 capitole. În capitolul 1, prin exemple simple, se specifică domeniile de aplicabilitate a comparării matricilor stochastice, printre care amintim: teoria informaţiei, statistică, economie, genetică, ecologie, demografie, automate aleatoare, fizică statistică. În capitolul 2 se evidenţiază câteva proprietăţi ale funcţiilor subliniare, divergenţelor între doi sau mai mulţi vectori stochastici, coeficienţilor de ergodicitate Dobruşin, precum şi relaţiile dintre acestea. Capitolul 3 conţine 16 definiţii corespunzătoare modurilor de comparare a performanţelor canalelor. Printre criteriile de comparare, amintim: degradarea, incluziunile, densitatea, capabilitatea, capacitatea, contractivitatea. În capitolele 4 şi 5 se demonstrează echivalenţa sau implicaţia care există între unele criterii de comparare. Pe câteva exemple specifice, în capitolul 6 se analizează canalele cu alfabet de intrare format numai din doi simboli. Capitolul 7 conţine câteva probleme deschise, legate de subiectele primei părţi.

Partea a doua intitulată "Divergenţa şi coeficienţii de contracţie", este divizată în 8 capitole. Dintre generalizările rezultatelor primei părţi, se remarcă cele ale inegalităţii lui Dobruşin, privind coeficienţii de ergodicitate şi contracţie. Un loc important în partea a doua îl ocupă conceptul de divergenţă pentru măsuri pozitive şi finite. Folosind divergenţa globală se obţin moduri de comparare a experimentelor statistice. Cartea mai conţine o bibliografie, un indice de notaţii principale şi un indice de subiecte.

Materialul conţinut în această carte este accesibil şi util tuturor celor care posedă cunoştinţe generale asupra matricilor stochastice şi teoriei matematice a informaţiei.

E. Nenciu

CHEN, JIE; GUPTA, A.K. – *Parametric Statistical Change Point Analysis,* Birkhäuser Verlag, Boston-Basel-Berlin, 2000, VIII+192pp., ISBN 3-8176-4169-6.

Monografia prezentă este destinată inferenţei statistice privind detectarea şi estimarea schimbărilor survenite, în anumite puncte într-un model statistic. Punctul la care are loc schimbarea poate fi o poziţie sau un moment de timp. Atât numărul cât şi poziţiile punctelor schimbării sunt necunoscute. Aceste puncte determină variaţia repartiţiei probabilistice a variabilelor aleatoare observate. Punctele schimbate pot fi medii, varianţe, covarianţe, coeficienţi de regresie. Analiza satistică a unor asemenea puncte se efectuează în două etape. În prima etapă se detectează prezenţa schimbării, cu ajutorul unui test statistic parametric. În a doua etapă se determină numărul şi localizarea punctelor schimbării prin intermediul estimării punctuale a parametrilor modelului.

Conţinutul cărţii este divizat în 7 capitole destinate modelelor continue (Gaussian univariant şi multivariant, Gamma, exponenţial) şi discrete (binomial, Poisson). Un întreg capitol este consacrat regresiei liniare simple şi multiple. Metodologiile folosite sunt specifice analizei Bayesiene, statisticii neparametrice, proceselor stochastice şi teoriei matematice a informaţiei. O frecvenţă mare de utilizare o au criteriile informaţionale (AIC) şi (SIC) introduse de H. Akaike (1973), respectiv, G. Schwarz (1978). Fiecare capitol conţine exemple numerice. Cartea se încheie cu o bibliografie, un indice de autori şi un indice de subiecte.

Această monografie poate fi utilă cercetătorilor din domeniile: economie, medicină, psihologie, geologie, controlul calităţii.

E. Nenciu

BÖTCHER, ALBRECHT; GOHBERG, ISRAEL; JUNGHANNS, PETER (Eds.) – *Toeplitz Matrices and Singular Integral Equations,* Birkhäuser Verlag, Basel-Berlin-Boston, 2002, 334 pp., Hardcover, sFr. 169.-/EUR 110.28, ISBN 3-7673-6877-2.

Acest volum, dedicat lui Bernd Silbermann, cu ocazia celei de a 60-a aniversări, colectează articole de cercetare privind matrici Toeplitz şi ecuaţii integrale singulare. Lucrările sunt semnate de experţi de frunte în domeniile abordate care includ metode de algebre Banach, determinanţi Toeplitz şi teoreia matricelor aleatoare, teoria lui Fredholm şi analiză numerică pentru ecuaţii integrale singulare. La toate acestea se adaugă algoritmi eficienţi pentru sisteme liniare cu matrici structurate. Subiectele menţionate reflectă un spectru larg de interese de cercetare ce-l caracterizează pe cel sărbătorit.

Volumul mai conţine o schiţă biografică şi o listă de publicaţii. Articolele sunt scrise cu grijă şi sunt accesibile cititorilor cu cunoştinţe de bază în analiză funcţională şi teoria operatorilor.

Cartea se adresează unui public larg din ştiinţele matematice şi inginereşti.

Şt. Frunză

HAROSKE, D.; RUNST, TH.; SCHMEISSER, H.-J. (Eds.) – *Function Spaces,* Differential Operators and Nonlinear Analysis The Hans Triebel Anniversary Volume, Birkhäuser Verlag AG, Basel-Berlin-Boston, 2003, 488 pp., Hardcover, CHF 138.-/EUR 88, ISBN 3-7643-6935-3.

Acest volum se bazează pe lecţiile prezentate la Conferinţa Internaţională "Spaţii de funcţii, operatori diferenţiali şi Analiză neliniară", ţinută în perioada iunie 28-iulie 4, 2001, la Teistungen, Thuringia (Germania). Cartea este dedicată lui Hans Triebel cu ocazia celei de a 65-a aniversări şi reflectă influenţa sa hotărâtoare în dezvoltarea teoriei moderne a spaţiilor de funcţii în ultmii 30 de ani cu numeroase aplicaţii în matematica pură şi aplicată.

Volumul este subdivizat în trei părţi.

Partea I conţine două lecţii având caracter de privire generală asupra contribuţiilor lui Hans Triebel. Partea a doua reflectă contribuţii recente în teoria spaţiilor de funcţii şi a ecuaţiilor cu derivate parţiale prezentate de şapte experţi de marcă în domeniu.

Partea a treia conţine scurte comunicări legate de cercetările lui Hans Triebel şi subiectul conferinţei.

Atât conferinţa cât şi volumul care o însoţeşte reprezintă un eveniment deosebit având în vedere impactul deosebit pe care cercetările lui Hans Triebel le-au avut în ultimii 30 de ani în diverse domenii ale analizei matematice şi aplicaţiilor acesteia.

Suntem convinşi că volumul va fi de un real folos şi va lăsa o impresie deosebită tuturor celor interesaţi de acest domeniu.

Şt. Frunză

PREM, K. KYTHE; DONGMING, WEI – *An Introduction to Linear and Nonlinear Finite Element Analysis. A Computational Approach.,* Birkhäuser

Verlag, Boston-Basel-Berlin, 2004, xxii+ 445pp., ISBN 0-8176-4308-7, CHF 144, EUR 95.

Cartea este dedicată metodei elementului finit pentru aproximarea problemelor liniare sau neliniare din cele mai diverse domenii ale mecanicii, ingineriei electrice, ingineriei chimice, geofizicii şi matematicilor aplicate. Faţă de alte cărţi consacrate acestei metode moderne a analizei numerice, volumul acoperă un curs introductiv pe înţelesul studenţilor de diferite specialităţi, accentul fiind pus mai mult pe algoritmii de calcul şi mai puţin pe fundamentarea pur matematică. Cursul începe cu aplicaţii pentru probleme liniare unidimensionale şi bidimensionale din mecanica mediilor elastice şi plastice, propagarea căldurii, sisteme termoelastice şi de mecanica fluidelor. Apoi se trece la tehnici avansate pentru probleme neliniare: metode de pantă maximă, de gradienţi, conjugaţi, metode Newton şi de penalizare.

Cartea conţine 87 exemple şi 148 exerciţii cu soluţii şi indicaţii conţinute în text. În volum se fac referiri la implementarea pe calculator a algoritmilor şi sunt prezentate programe Fortran, Matlab, Mathematica şi Ansys.

C. Ilioi

ALFSEN, ERIK M.; SHULTZ, FREDERIC W. – *State Spaces of Operators Algebras, Basic Theory, Orientation, and C*-products,* Birkhäuser Verlag, Boston 2001, 368 pp., Hardcover, sFr. 128.-,DM 170.- oS 1241., ISBN 0-8176-3890-3.

This self-contained work, focusing on the theory of state spaces of C^*-algebras and von Neumann algebras, explains how the oriented state space geometrically determines the algebra. The theory of orientation of C^*-algebra state spaces is presented with a new approach that does not depend on Jordan algebras, and the theory of orientation of normal state spaces of von Neumann algebras is presented with complete proofs for the first time. The theory of operator algebras was initially motivated by applications to physics, but has recently found unexpected new applications to fields of pure mathematics as diverse as foliations and knot theory.

Key features include: - first and only work devoted to state spaces of operator algebras - contains much material not available in existing books - prerequisites are standard graduate courses in real an complex variables, measure theory and functional analysis - complete proofs of basic results on operator algebras presented so that no previous knowledge in the field is needed - detailed introduction develops basic tools used throughout the text.

The content: *1: Introduction* (Basic notions from convexity and ordered vector spaces; Order unit and base norm spaces; Selected topics in functional analysis; Spectral theory for monotone complete $C(X)$; Elementary dimension theory in lattices; Ordered algebras; Algebras with involution; Other derivations.)

2: Elementary Theory of C^*-algebras and von Neumann Algebras (Basics on C^*-algebras; Representations of C^*-algebras; Preliminaries on $B(H)$; Basics on von Neumann algebras; Miscellaneous.)

3: Ideals, Faces and Compressions (Projections, ideals, and faces for von Neumann algebras; Projections, ideals, and faces for C^*-algebras; Invariant subspaces; Compressions of von Neumann algebras.)

4: The Normal State Space of $\mathcal{B}(H)$ (Facial Structure; The concepts of angle and geodesic metric; *-isomorphisms and *-anti-isomorphisms; Orientation of balls and multiplication in $M(\mathbb{C})$.)

5: States, Representations, and Orientations of C^*-algebras (State space geometry and representations; The spectrum and primitive ideal space; Completely positive maps; Orientations of state space; Orientations and C*-structures; Orientations and non-unital C^*-algebras.)

6: Symmetries and Rotations in von Neumann Algebras (Elements of structure theory; Symmetries and reflections; Rotational derivatives.)

7: Orientations and von Neumann Algebras (Balanced symmetries and associative products; Cartesian triples and 3-frames; Orientation of normal state spaces; From orientations to associative products.)

The book contains also, besides notes to each chapter, the bibliography and an index.

E. Popa

BOLTON, S.; BON, CH. – *Pharmaceutical Statistics: Practical and Clinical Applications,* 4th edition, revised and expanded, Drugs and the Pharmaceutical Sciences, vol. 135, Marcel Dekker, Inc., New York, Basel, 2004, xvi+755pp.

Cartea cu titlul mai sus menţionat îşi propune ca obiectiv prezentarea unor aspecte practice ale statisticii, pentru uzul farmaciştilor şi medicilor. Primele capitole familiarizează cititorul cu statistica descriptivă şi bazele teoriei probabilităţilor. Se trece apoi la prezentarea materialului principal: intervale de încredere şi teste parametrice, regresie şi corelaţie, analiză dispersională, teste ne-parametrice, simulare Monte Carlo, controlul calităţii şi altele. Fiecare capitol se încheie cu un set de exerciţii propuse (care are rolul de a fixa mai bine teoria) şi o serie de referinţe bilbiografice. Cartea se

încheie cu un glosar de termeni, 9 apendice, răspunsuri la exerciţiile propuse şi un index.

Descrierea este bogat ilustrată cu exemple din practica farmacologică şi medicală. Volumul este însoţit de un compact disc (Excel Workbooks and SAS Programs for IBM PC and compatible systems.)

Lucrarea este utilă tuturor celor interesaţi de aplicaţiile statisticii în farmacologie şi medicină.

M. Turinici

CAPRIZ, GIANFRANCO; MARIANO, PAOLO MARIA (Eds.) – *Advances in Multifield Theories for Continua with Substructure*, Birkhäuser Verlag, Basel-Berlin-Boston, 2004, IX+263pp., ISBN 3-7643-4324-9, SPIN 10920787.

Folosirea frecventă a *materialelor complexe* (complex materials) în nanotehnologie şi în ingineria industrială conduce la probleme de Mecanică a Mediilor Continue de mare dificultate. Legile constitutive ale substructurilor unui material complex determină în mod decisiv comportarea macroscopică a acestuia. Teoriile de *multicâmp* (multifield theories) ale mecanicii continuului conduc la elaborarea unor metode şi instrumente matematice necesare modelării în vederea descrierii comportării macroscopice a materialelor complexe. General vorbind, teoriilor de multicâmp fac legătura dintre partea clasică a ştiinţei materialelor şi mecanica modernă a mediilor continue cu substructuri.

Prezentul volum conţine zece contribuţii valoroase care pun în evidenţă un larg spectru de subiecte făcând parte din domeniul general al teoriilor de multicâmp.

Iată autori şi titlurile celor zece contribuţii: 1. M. Silhavý -Work Conditions and Energy Functions for Ideal Elastic-Plastic Materials; 2. G.P. Parry - Generalized Elastic -Plastic Decomposition in Defective Crystals, 3. H. Cendra, J. Marsden, T.S. Raţiu - Cocycles, Compatibility and Poisson Brackets for Complex Fluids; 4. O.B. Naimark - Defect -Induced Transitions as Mechanisms and Failure in Multifield Continua; 5. I. Müller - Extended Thermodynamics: A Multifield Theory Par Excellence; 6. E. De Angelis, G.M. Casciola, P.M. Mariano and R. Piva - Microstructure and Turbulence in Dilute Polymer Solutions; 7. R. Segev - Fluxes and Flux -Conjugate Stresses; 8. Y. Grabovsky - Algebra, Geometry and Computations of Exact Relations for Effective Moduli of Composites; 9. D. Bernardini, T.J. Pence - Multifield Theory for the Modeling of the Macroscopic Behaviour of Shape Memory Materials; 10. G. Capriz, P.M. Mariano - Balance at a Junction among Coherent Interfaces in Materials with Structure.

Scoatem în evidenţă câteva dintre chestiunile tratate în contribuţiile de înaltă ţinută ştiinţifică prezentate mai sus: a) Proprietăţi energetice şi

geometrice ale materialelor cristaline elastoplastice în cazul deformaţiilor mari; b) Cercetări privind plasticitatea structurilor cristaline cu defecte; c) Structuri Poisson pentru fluide complexe; d) Teorii statistice de multicîmp folosite în descrierea mecanismelor ireversibile macroscopice; e) O analiză amănunţită arată că chiar un gaz ideal monoatomic se comportă ca un material complex cel puţin în stare rarefiată. În acest caz, *Termodinamica Extinsă* (Extended Thermodynamics), prin excelenţă o teorie de multicâmp este un instrument indispensabil în descrierea dispersiei luminii într-un gaz şi a studiului structurii de şoc într-un tub de şoc; f) Reducerea forţelor ce se opun curgerii (drag reduction) sub acţiunea substructurilor macromoleculare în cazul fluidelor polimerice în prezenţa turbulenţei; g) Teoria tensiunii pe varietăţi diferenţiabile şi studiul proprietăţilor topologice ale tensiunilor şi defectelor în materiale cu microstructură; h) Punerea în evidenţă a unor relaţii exacte care descriu comportarea efectivă a compozitelor (exemple naturale de materiale complexe) mai generale decât policristalele; i) Modelarea comportării Macroscopice a materialelor cu memoria formei (shape memory materials) în contextul unei teorii de multicâmp; j) Deducerea ecuaţiilor de echilibru în puncte de joncţiune între interfeţe coerente în medii continue prezentând substructuri materiale.

Contribuţiile publicate în acest volum îşi au originea în lucrările *Congresului Internaţional al Asociaţiei Italiene de Mecanică Teoretică şi Aplicată* (AIMETA) care a avut loc la Taormina, Italia, în 2001.

Volumul de faţă este de mare interes pentru o largă categorie de cercetători interesaţi de probleme de matematică aplicată şi industrială, inginerie mecanică şi civilă, ştiinţa materialelor, etc.

Gh.Gr. Ciobanu

BELTIŢĂ, DANIEL; ŞABAC, MIHAI – *Lie Algebras of Bounded Operators,* Operator Theory Advances and Applications, vol.120, Birkhäuser Verlag, Basel-Boston-Berlin, 2001, viii+219pp.

Algebrele Lie infinit dimensionale s-au impus atenţiei încă de la începutul dezvoltării teoriei iniţiată de Lie. Acum există deja câteva monografii consacrate acestui subiect.

Cartea pe care o recenzăm este unica ce exploatează din plin rezultate din teoria operatorilor -greu accesibile publicului larg.

De altfel, legăturile între teoria operatorilor şi teoria algebrelor Lie s-au vădit a fi bilaterale, oricare din cele două teorii având o influenţă semnificativă asupra celeilalte.

Unul din scopurile declarate (şi realizate) ale cărţii a fost de a exprima rezultatele cele mai importante privind algebrele Lie de operatori mărginiţi pe spatii Banach.

Un al doilea scop a fost să definească şi să studieze o noţiune naturală de spectru pentru anumite sisteme de operatori care nu comută.

O mare parte a rezultatelor expuse aparţin autorilor şi au fost publicate în reviste prestigioase. În acelaşi timp, toate celelalte lucrări importante asupra subiectului se găsesc expuse aici în mod sistematic.

Prin aceasta, cartea va deveni cu siguranţă un reper în domeniul algebrelor Lie.

Recomandăm folosirea cărţii atât ca lectură individuală cât şi pentru expuneri în cadrul seminariilor de cercetare.

Şt. Frunză

HOFFMAN, KARL-HEINZ; HOPPE, H.W.; SCHULZ, VOLKER (Eds.) – *Fast solution of Discretized Optimization Problems,* International Series of Numerical Mathematics, Vol. 138, Birkhäuser Verlag, Basel-Boston-Berlin, ISBN 3-7643-6599-4.

This book contains selected papers presented at the International Workshop on "Fast Solution of Discretized Optimization Problems" held at the Weierstrass Institute for Applied Analysis and Stochastic in Berlin from May 08 until May 12, 2000. The aim of the workshop was to improve the exchange of ideas between the separated disciplines of nonlinear optimization and numerical methods for differential equations.

The various topics discussed included: discretizations for optimization problems, large scale optimization, iterative linear and quadratic solvers, QP-preconditioning, sparce QP and linear solvers, suboptimal solution approaches, real time optimization, interior point methods, adaptivity.

Particular emphasis has been laid on numerical methods which are motivated by specific application problems.

C. Moroşanu

SURIS, Y.B. – *The Problem of Integrable Discretization: Hamiltonian Approach*, Birkhäuser Verlag, Basel-Berlin-Boston, Progress in Mathematics, vol. 219, xxi+1070pp., 2003, ISBN 3-7643-6995-7, CHF 228.-/EUR 148.

The book explores the theory of discrete integrable systems, with an emphasis on the following general problem: how to discretize one or several of independent variables in a given integrable system of differential equations,

maintaining the integrability property? This question (related in spirit to such o modern branch of numerical analysis as geometric integration) is treated in the book as an immanent part of the theory of integrable systems, also commonly termed as the theory of solitons.

Among several possible approaches to this theory, the Hamiltonian one is chosen as the guiding principle. A self-contained exposition of the Hamiltonian (r-matrix, or "Leningrad") approach to integrable systems is given, culminating in the formulation of a general recipe for integrable discretization of r-matrix hierarchies. After that, a detailed systematic study is carried out for the majority of known discrete integrable systems which can be considered as discretizations of integrable ordinary differential or differential-difference (lattice) equations. This study includes, in all cases, a unified treatment of the correspondent continuous integrable systems as well. The list of systems treated in the book includes, among other: Toda and Volterra lattices along with their numerous generalizations (relativistic, multi-field, Lie-algebraic, etc.), Ablowitz-Ladik hierarchy, peakons of the Camassa-Holm equations, Garnier and Neumann systems with their various relatives, many-body systems of the Calogero-Moser and Ruijsenaars-Schneider type, various integrable cases of the rigid body dynamic. Most of the results are only available from recent journal publications, many of them are new.

Thus, the book is a kind of encyclopedia on discrete integrable systems. It unifies the features of a research monograph and a handbook. It is supplied with an extensive bibliography and detailed bibliographic remarks at the end of each chapter. Largely self-contained, it will be accessible top graduate and post-graduate students as well as to researches in the area of integrable dynamical systems. Also those involved in real numerical calculations or modelling with integrable systems will find it very helpful.

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BUHMANN, M.; MACHE, D. – *Advanced Problems in Constructive Approximation*, International Series of Numerical Mathematics, vol. 142, Birkhäuser Verlag, Basel-Berlin-Boston, 2003, 288pp., Hardcover, ISBN 3-7643-6648-6, CHF 148.-/EUR 98.

The current form of modern approximation theory is shaped by many new developments which are the subject of the International Dortmund Meetings on Approximation Theory (IDoMAT). This meeting was particular in that it was held at the time of Professor Manfred Müler‘s retirement. It was therefore buth a celebration of approximation theory and of the many contributions Professor Müler made to approximation theory as well as his

friendship with many of the meeting‘s delegates, including, of course, the editors of this volume. It is meant not only as a proceedings of the IDoMAT meeting, but also as a Festschift in honor of Manfred Müler. This volume is therefore in its entirety dedicated to him.

This volume contains refereed articles originating from IDoMAT 2001 that took place in Witten-Bommerholz in August 2001.

The contributors are renowned international experts in their individual field of research, including approximation methods, orthogonal polynomials, radial basis functions, multivariate spline approximation and interpolation, Pade approximation polynomial approximation, and quasi-interpolation. As many applications to areas such as CAD or tomography are discussed, the book should be of interest to both mathematicians and engineers.

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DEMUTH, M.; SCHULZE, B.-W. – *Partial Differential Equations and Spectral Theory*, PDE2000 Conference in Clausthal, Germany, Operator Theory: Advances and Applications, vol. 126, Bikhäuser Verlag, Basel-Berlin-Boston, 2001, x+353pp., ISBN 3-7643-6219-7, sFR. 148.-/DM 196.-/öS 1431.-/EUR 98.

The intention of the international conference PDE2000 was to bring together specialists from different areas of modern analysis, mathematical physics and geometry, to discuss not only the recent progress in their own fields but also the interaction between these fields. The special topics of the conference were spectral and scattering theory, semiclassical and asymptotic analysis, pseudodifferential operators and their relation to geometry, as well as partial differential operators and their connection to stochastic analysis and to the theory of semigroups.

The scientific advisory board of the conference in Clausthal consisted of M. Ben-Artzi (Jerusalem), Chen Hua (Peking), M. Demuth (Clausthal), T. Ichinose (Kanazawa), L. Rodino (Turin), B.-W. Schulze (Potsdam) and J. Sjöstrand (Paris).

The book is aimed at researchers in mathematics and mathematical physics with interests in partial differential equations and all its related fields.

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ANTONTSEV, S.N.; DÍAZ, J. I.; SHMAREV, S. – *Energy Methods for free Boundary Problems Applications to Nonlinear PDEs and Fluid Mechanics*,

Progress in Nonlinear Differential Equations and Their Applications, Vol.48, Birkhäuser Verlag, Basel-Boston-Berlin, 2002, xii+329 pp., ISBN 0-8176-4123-8, 3-7643-4123-8, SPIN 10716475, EUR 120.

The book under review is a well-done selection of the most powerful energy methods – some of them very recent – used in the study of free boundary problems in nonlinear partial differential equations. These methods prove their effectiveness in all cases when comparison principles do not hold, or are very difficult to apply, as for instance in the study either of higher order partial differential equations, or of systems including equations of different types. In many such cases, using conservation, or balance type laws one may obtain ordinary differential inequalities for different types of energy as: kinetic, potential, etc. inequalities which are useful substitutes for classical comparison arguments. All these procedures are known as energy methods and were systematically developed over the past three decades.

The book consists of two parts. The first one, i.e. Chapter 1–3, is devoted to an elegant and convincing explanation of the way how to apply the energy methods in the study of several general classes of nonlinear partial differential equations and systems. The second one, i.e Chapter 4, includes a thorough collection of applications of the theory in Fluid Mechanics. A short appendix collects some special results used in the presentation.

Clearly and concisely written and containing a plenty of examples and applications, this monograph is of interest for all those mathematicians, or applied mathematicians, working in Partial Differential Equations, Nonlinear Analysis and Fluid Mechanics, physicists and engineers.

I. Vrabie

COLLI, PIERLUIGI; VERDI, CLAUDIO; VISINTIN, AUGUSTO – *Free Boundary Problems, Theory and Applications*, ISNM International Series of Numerical Mathematics, Vol.147, Birkhäuser Verlag, Basel-Boston-Berlin, 2004, viii+346 pp., ISBN 3-7643-2193-8, CHF 158.-/EUR 98.

It is by now well-recognized that many phenomena can be described by means of partial differential equations whose unknown functions are defined on a domain whose boundary is not a priori known. Examples of this sort are: ice melting, grain boundary motion, crystal growth of polymeric materials, plasma expansion in vacuum, reaction diffusion processes, filtration through porous media, all justifying the generic name of *free boundary problems* given to the corresponding mathematical models. The volume under review represents the proceedings of a conference held in June 2002 in Trento

(Italy) and provides, as the editors state: "a comprehensive picture of the development of research on free boundary problems in the last decades". The main topics covered by this volume are: free boundary problems in polymer science and biomathematics, image processing, grain boundary motion, numerical aspects of free boundary problems, medelling in crystal growth, transition in anisotropic materials. Many new problems and models are included.

The volume, which contains the contributions of 56 specialists in the field, is of interest for researchers and post-graduate students in applied mathematics, physics, biology and material sciences.

I. Vrabie

TARKHANOV, NIKOLAI N. – *Free Boundary Problems The Analysis of Solutions of Elliptic Equations*, Mathematics and Its Applications, Vol.406, Kluwer Academic Publishers, Dordrecht-Boston-London, 1997, xx+479 pp., ISBN 0-7923-4531-2, USD 245.-/GBP 146.

The monograph under review is an updated and revised translation of the original Russian work: "*Laurent Series for Solutions of Elliptic Equations*", published in 1991 by Nauka Novosibirsk, and it is mainly concerned with the analysis of solutions to general elliptic equations from the point of view of: removable singularities (Chapter 1), Laurent expansions (Chapter 2), representation of solutions with nondiscrete singularities (Chapter 3), uniform approximation (Chapter 4), mean approximation (Chapter 5), BMO approximation (Chapter 6), conditional stability (analytic continuation and Carleman formulas) (Chapter 7), the Cauchy problem (Chapter 8) and quasiconformality (Chapter 9). Although the main emphasis is on the Dirichlet problem for the Laplacian, there are some other cases considered, as for instance the Cauchy problem, for a differential operator (with either surjective or injective symbol) with data given either on the whole boundary or on part of the boundary. The author pays a great attention to distinguish between very general results, which hold for the class of the elliptic equations with the unique continuation property, and more specific ones, requiring suitable extra-assumptions on the differential operators involved. It should be emphasized that the book contains also some remarkable parallels with the theory of functions of several variables.

This excellent monograph is of interest for researchers and postgraduate students working in partial differential equations, removable singularities, potential theory, approximation and expansions, several complex variables and analytic spaces, and functional analysis.

I. Vrabie

ABDELHAMID ELAISSARI (Ed.) – *Colloidal Biomolecules, Biomaterials, and Biomedical Applications*, Surfactant Science Series, vol. 116, Marcel Dekker, Inc., New-York, 2004, XII+488pp., ISBN 0-8247-4779-8.

The book under review presents the utilization of colloids in diagnostic and therapeutic. Colloids are solid-phase carries for various molecules, biomolecules and actives agents. In diagnostic, the immobilization of various biomolecules onto colloiodal particles is very important and, in many cases, a critical point. In therapeutic areas, various colloidal particles are evaluated as carriers, and are principally used as solid supports rather than as a micro-container of active molecules. The book is dedicated to Doctor Christian Pichot and opens with a presentation of his scientific activity.

The volume contains 15 chapters on various properties and applications of colloidal particles: the use of magnetic particles either as solid phase of particle carrier; the aggregation of latex particles and applications to specific agglutination tests; immunological assays based on agglutination of latex particles; the capture and the detection of biomolecules using dual colloid particles; biospecific interactions between polystyrene beads and viral particles, and biomedical applications; the adsorption properties and the chromatographic behaviors of monodispersed latex particles; the interaction of proteins with thermally sensitive particles; DNA-like polylectrolyte adsorption onto polymer colloids; the aminocontaining latexes appearing as a solid support of single-stranded DNA and their use in diagnosis; the covalent immobilization of peptides onto reactive latexes; the preparation of the silicone emulsions and their applications; the elaboration of colloidal particles from preformed polymers; the preparation of the poly (alkylcynoacrylates) and their applications as drug delivery systems; the preparation of biodegradable particles by polymerization processes supercritical fluid processes for polymer particle engineering and applications in the therapeutic area.

Gabriel Liţcanu

HAUSSMANN, W.; JETTER, K.; REIMER, M.; STÖCKLER, J. (Eds.) – *Modern Developments in Multivariate Approximation*, 5th International Conference, Witten-Bommerholz (Germany), September 2002, International Series of Numerical Mathematics 145, vol. Birkhäuser Verlag, Basel-Boston-Berlin, 2003, 319pp., ISBN 3-7643-2195-4, CHF 148.-/EUR 98.-.

The book contains a selection of eighteen reviewed articles that were presented at the 5^{th} International Conference on Multivariate Approximation, held in WittenBommerholz. "Multivariate Approximation Methods for the

Pricing of Catastrophe-Linked Bonds", by H. Albrecher, J. Hartinger and R.F. Tinchv describes Monte-Carlo and Quasi -Monte Carlo techniques used for approximating an s-dimensional integral. A large part of the article is dedicated to numerical implementations that show that the QMC techniques outperform the classical MC ones in terms of efficiency.

"Note on a Generalized Invariance Principle and its Relevance for Cap Discrepancy and Energy", by J.S. Brauchart extends the Stolarsk′s invariance principle. The author proves "the extended invariance principle" that also gives a lower bound for the spherical cap discrepancy. An integral representation for the energy which involves discrepancy functions is obtained.

"On Properties of Nonstationary Divided Difference Vector Subdivision Schemes" by M. Charina and C. Conti studies vector subdivision schemes. The two authors have investigated in a previous paper the problem of the regularity of multivariate vector subdivision schemes following the difference operator approach, without the eigenvalue condition assumption satisfied by the matrix mask. In the present paper the authors analyze the properties of a nonstationary divided difference vector subdivision scheme. An example showing how the theory works out is presented in the end.

"Multivariate Balanced Vector-Valued Refinable Functions" by C.K. Chui and Q. Jiang generalizes the notion of k-balanced multiwavelets from the orthonormal setting to the biorthogonal and multivariate settings. Examples are given, for the univariate quadratic and cubic spline function vector, then for continuous piecewise linear polynomials on the four-directional mesh in R^2 and in the end for C^1 cubic bivariate splines.

"Transfinite Interpolation by Blending Functions, Best One-Sided L^1-Approximation and Cubature Formulae", by D.P. Dryanov extends classical interpolation schemes to transfinite interpolation by blending functions, Lagrange interpolation by univariate polynomials to Lagrange transfinite interpolation, defines transfinite Hermite interpolation by blending functions and constructs Newton-Cotes type cubature formulae.

"Refining Oscillatory Signals by Non-Stationary Subdivision Schemes", by N. Dyn, D. Levin and A. Luzzatto gives a method for refining real highly oscillatory signals. The approach is of an interpolation problem and the authors define a space of trigonometric functions. Numerical examples in the case of a family of signals with an almost compactly supported Fourier transform are presented.

"Asymptotic Error Expansion for Schoenberg Type Operators", by K. Dziedziul and K. Jetter introduces the Schoenberg operator. The authors state an error expansion for these operator, in case $r > d/2$. In the last section the polyphase case is studied.

"On the Approximation Order and Numerical Stability of Local Lagrange Interpolation by Polyharmonic Splines", by A. Iske, introduces polyharmonic splines. The paper proves convergence rates for local Lagrange interpolation by polyharmonic splines. In the end a numerically stable algorithm

for the evaluation of polyharmonic spline interpolants is described.

"Isolated Singularities of Harmonic Functions", by L. Karp and H.S. Shapiro gives a sufficient condition for removability of an isolated singularity of a harmonic function, condition expressed in terms of Newtonian capacity, with a generalization for harmonic functions in the three-dimensional case.

"Two applications of Adaptive Wavelet Methods" by A. Kunoth presents two different applications where the particular features of wavelet bases are exploited. The first application concerns data fitting and the second one is an optimal control problem with constraints in the form of a linear elliptic partial differential equation, illustrated in terms of a Neumann problem with distributed control.

"Almost Interpolation and Radial Basis Functions", by A. Le Mehaute, deals with multivariate interpolation by sums of radial basis functions. The present paper proves that if we replace the interpolation by almost interpolation we can relax the conditions imposed to the position of the interpolation points and use a very broad class of radial functions.

"Fundamental Splines on Triangulations", by G. Nurnberger and F. Zeilfelder analyzes properties of the fundamental splines associated with local Lagrange interpolation for C^1 splines introduced by the same authors in a previous paper. They consider in this paper the interpolation by bivariate polynomials splines.

"Integer DCT-II by Lifting Steps" by P. Plonka and M. Tasche gives a new approach to construct an integer DCT-II introduced previously by the same authors, the computations being done with floating point numbers, but the result is integer and the property of left-invertibility is preserved.

"Approximation of Density Functions and Reconstruction of the Approximant", by M. Reimer reports on a positive summation methods for Appel series with favorable localization properties, gained from the Neumann-Shapiro operators.

"On Some Multivariate Quadratic Spline Quasi-Interpolants on Bounded Domains", by P. Sablonniere studies some C^1 quadratic (d-quadratic) spline quasi-interpolants ($dQIs$) on bounded domains with d real dimensions $d = 1, 2, 3$.

"How to Generate Smoother Refinable Functions from Given Ones", by T. Sauer introduces the concept of refinable functions through its mask. The author proves a relation between a convergent subdivision scheme and its associated derivative scheme. The simplest example of bivariate refinable functions with dyadic scalic illustrates the presented concept.

"Reconstructing Multivariate Functions from Large Data Sets", by H. Wendland gives an efficient method for reconstructing multivariate functions from large sets of scattered data. The method is applied for three examples: one for solving partial differential equations numerically by collocation, the second being a problem of fluid-structure interaction and the third one reconstructing a three dimensional surface from an unorganized

three-dimensional point cloud.

"Three Scale Versus Matrix Refinement Equations", by G. Zimmermann shows that three scale refinement equations are equivalent to matrix refinement equations of a certain structure, under some conditions. An application that smoothes the pyramidal functions of the Conti-Jetter scheme is made.

Gabriela Tănase

CHENTSOV, A.G. – *Asymptotic Attainability*, Kluwer Academic Publishers, Dordrecht-Boston-London, xiv+322pp., ISBN 0-7923-4302-6.

Monografia cu titlul mai sus menţionat îşi propune ca obiectiv prezentarea unor chestiuni de accesibilitate asimptotică din teoria controlului. Materialul ei este divizat în trei mari părţi. Prima din ele (capitolele 1-4) pune bazele conceptuale ale celorlalte două şi discută unele variante tipice de perturbaţii şi restricţii în problemele naturale de control. A doua parte (capitolul 5) include aplicaţii ale metodelor din capitolele 3 şi 4 la probleme extremale. În fine, partea a treia (capitolele 6 şi 7) este consacrată unor extensii ale celor discutate anterior.

Lucrarea este utilă tuturor celor interesaţi de teoria controlului optimal şi aplicaţiile sale.

M. Turinici

RAO, M.M.; REN, Z.D. – *Applications of Orlicz Spaces*, Pure and Applied Mathematics, nr. 250, Marcel Dekker, Inc. 2002, xi+464 pp., New York·Basel, ISBN 0-8247-0730-3.

In ten chapters, the book presents some important applications in which the theory of Orlicz spaces plays a crucial role.

Chapter I includes quantitative indices of N-functions, properties of general Young functions as well as certain interpolation inequalities. Then, the next four chapters present aspects of quatitative geometry, specialized from the general Banach space theory for Orlicz sequence and functions spaces. Chapter IV is devoted to Fourier analysis including conjugate functions with Ryan′s extension of the classical M. Riesz theorem, a Hausdorff-Young theorem on compact and locally compact abelian groups and some results on generalized Orlicz spaces.

Chapter VII treats prediction analysis including work on vector calued functions and nonreflexive Orlicz spaces. Chapter VIII show the basic concepts are closely related to a class of Fenchel-Orlicz spaces. Also, martingale convergence and regularity properties of stochastic functions are considered. In Chapter IX we find applications of this work to partial differential equations. Chapter X contains supplements to the previous chapters including a section on Beurling-Orlicz classes of convolution algebras, geometric invariants with F. Riesz angles as well as a detailed analysis of nonlocally convex Orlicz spaces.

There is much new material in these chapters and the details appear here for the first time. With a significant bibliography, the book provides practical applications in statistic and probability, examines new perspectives and results from geometric, Fourier, stochastic, nonlinear partial equations, composition operators and metric function spaces and analysis.

Cristina Stamate

GUZMAN, ALBERTO – Derivatives and Integrals of Multivariable Functions, Birkhäuser Verlag, Boston-Basel-Berlin, x+319 pp., 2003, ISBN 0-8176-4274-9/3-7643-4274-9, SPIN 10851356.

Această carte constituie un curs de un semestru dedicat calculului diferenţial şi integral pentru funcţii de mai multe variable urmărind în primul rînd extinderea naturală a unor noţiuni şi rezultate cunoscute pentru funcţiile de o variabilă. De asemenea, se presupun cunoscute proprietăţi topologice de bază ale spaţiilor euclidiene, teoria convergenţei, limite şi continuitate pentru funcţiile scalare sau vectoriale de mai multe variabile reale, precum şi o serie de elemente de algebră liniară a spaţiilor euclidiene. Conţinutul carţii este divizat în următoarele şase capitole: 1. Diferenţiabilitatea funcţiilor de mai multe variabile. 2. Derivate ale funcţiilor scalare. 3. Derivate ale funcţiilor vectoriale. 4. Integrabilitatea funcţiilor de mai multe variabile. 5. Integrale ale funcţiilor scalare. 6. Integrale vectoriale şi teoreme ale câmpurilor vectoriale.

Autorul prezintă noţiunile şi rezultatele în mod natural cu motivări convingătoare, fiind preocupat nu numai de rigurozitatea ştiinţifică, ci şi de accesibilitatea materialului prezentat. Sunt date exemple şi figuri ilustrative, interpretări geometrice, fizice sau mecanice conducând astfel cititorul spre diverse aplicaţii remarcabile. La sfârşitul fiecărei secţiuni se propun mai multe exerciţii pentru rezolvare, soluţiile acestora şi unele indicaţii privitoare la rezolvarea lor sunt date după ultimul capitol al cărţii. De asemenea, de un real folos este Indexul de nume şi noţiunile de la sfârşitul cărţii.

Subliniem în mod deosebit condiţiile grafice ale acestui reuşit curs universitar asigurate de editura Birkhäuser.

Teodor Precupanu

PIKULIN, VICTOR P.; POHOZAEV, STANISLAV I. – *Equations in mathematical physics: a practical course*, Birkhäuser Verlag, Basel-Boston-Berlin, viii+207pp., 2001, ISBN 3-7643-6501-3.

This is a handbook addressed to students of technology institutes as well as to engineers and scientists. The main goal of the handbook is to treat the basic methods for solving the simplest problems of classical mathematical physics. The authors have treated the methods of separation of variables, Green function, conformal mapping, integral transforms, perturbation. Elliptic, hyperbolic and parabolic equations are treated. Several examples and exercises which allow to understand the methods described in the textbook are discussed.

The entire exposition is formal in nature. The reader interested in a deeper study of the methods treated here or other methods is refereed to the bibliography.

S. Aniţa