ANALELE STIINTIFICE ALE UNIVERSITATII "AL.I.CUZA" IASI
Tomul XXXVIII, s.I.a, Matematica, 1992, f.2

BOOK REVIEWS *RECENZII*

E.D. DE GOEDE - *Numerical methods for the three-dimensional shallow water equations on supercomputers,* C.W.I. Tract. 88, Stichting Mathematisch Centrum, Amsterdam, 1993, 124 p., ISBN 90 6196 417 2.

Cartea este dedicată metodelor numerice de rezolvare a ecuaţiilor apei superficiale tridimensionale pe calculatoare vectoriale în paralel. Primul capitol cuprinde deducerea ecuaţiilor care formează obiectul monografiei.In următoarele capitole se prezintă discretizarea numerică a acestor ecuaţii mai întâi în raport cu spaţiul şi apoi în raport cu timpul şi algoritmi de rezolvare a ecuaţiilor discretizate. Metodele de discretizare conţinute în carte sunt rezultate de ultimă oră ale autorului, o parte din ele nefiind încă publicate în lucrări ştiinţifice. Fiecare metodă este însoţită de rezultatele experimentelor numerice făcute de autor, diferite comentarii cu privire la implementare şi concluzii. Fiecare capitol se încheie cu o listă de referinţe bibliografice, iar în final există un indice de noţiuni. Tratatul se adresează unui spectru larg de specialişti în analiză numerică , mecanică şi inginerie.

C.Ilioi

SCHWARZ, M., *Morse Homology, Progress in Mathematics 111,* Birkhäuser Verlag, Basel, Boston, Berlin (1933), 248 pages SFR 68,00, ISBN 3 - 7643 - 2904 - 1 (Basel), ISBN 0 - 8176 - 2904 - 1 (Boston).

This book presents a link between modern analysis and topology. Based upon classical Morse theory it develops the finite dimensional analogue of Floer homology, which in the recent years has come to play a significant role in geometry.

The concept of relative Morse theory in combination with Conley's continuation principle lends to an axiomatic homology functor. As a consequence of this axiomatic approach he obtains the uniqueness for Morse homology, that is a natural equivalence to any other axiomatic homology theory which is defined on the same suitable large category of topological spaces, like for instance singular theory. The advantage of this result based on the axiomatic approach is that, in contrast to the classical investigation by Thom, Smale, Milnor, it is also valid for non- compact manifolds and for all Morse functions.

The author employs analytic methods in strict analogy with the construction of Floer's homology groups, that is a calculus for certain nonlinear Fredholm operators on Banach manifolds which here are curve spaces.

All theorems comprising Fredholm theory, regularity and compactness results, gluing and orientation analysis, together with their proofs and pre-requisit material, are examined in detail. This book is of great interest to mathematicians, graduate students with interest in geometry, analysis and dynamical systems.

Corina Mohorianu

Z. WESOLOWSKI (editor): *Nonlinear Vibration Problems,* 24, PWN - Polish Scientific Publishers, Warzawa, 1992, 304 pp., ISBN 83-01-10939-4, ISSN 044-1597.

This issue of "Nonlinear Vibration Problems", published by the Institute of Fundamental Technological Research of the Polish Academy of Sciences, contains 20 research papers in the branch of nonlinear dynamics. The subject matters of this work are concerned with oscillations of plane mechanisms, Hopf bifurcation, nonstationary, torsional or damped vibrations, steady-states in nonlinear systems, controllability of autonomous control systems, stochastic and orbital stability, supersonic flow, the solution of the nonlinear wave equation. All the papers are written in English, with summaries in English, Russian and Polish.

The book is designed to the researchers in vibrations, waves, stability, control, optimization, identification, and analytical mechanics problems. The contributions cover a wide range of topics of current interest to theoreticians and practitioners.

Gh.Procopiuc

DAVID H. TREVENA, *Statistical Mechanics, An Introduction,* Ellis Horwood, New York - London - Toronto - Sydney - Tokyo - Singapore, 1993, X + 148 pp., $ 27.00, ISBN 0 - 13 - 845512 - 0.

This work is a concise introductory book on the statistical mechanics which can be easily read and understood by second and third year undergraduates in physics, applied mathematics, physical chemistry, chemical engineering, metallurgy, materials science and polymer science. It will be useful to research workers in higher education, government establishments and industry.

The book starts with a brief historical introduction after which the Maxwell-Bolzman, Fermi-Dirac and Bose-Einstein statistics are treated, as is their application to gases and solids. Two novel features of the book are a chapter on liquids and a chapter devoted entirely to worked examples.

Gh.Procopiuc

T.J. CHUNG, *Continuum Mechanics,* Prentice-Hall International, Inc., Englewood Cliffs, NJ, 1988, X+368 pp., ISBN 0 - 13 - 171497 - X.

The present book is envisioned as one which provides a basic understanding of the fundamental laws governing physical phenomena which arise in many disciplines of engineering, such as solid mechanics, fluid mechanics, gas dynamics, and heat transfer.

The book is divided into two parts. Part I contains basic topics such as mathematical preliminaries, stress, strain, elastic solids, and Newtonian fluids. In Part II are presented applied topics, including flexural continua, inelastic solids, and non-Newtonian fluids. The solution of engineering problems are shared by almost all disciplines to which this book is addressed. Also, the reader will find tensor analysis and integral part of continuum mechanics. It is intended that this text serve not only as a bridge to various areas of specialization in engineering, but also as an interdisciplinary mediator seeking to generalize and unify specialized topics.

Gh.Procopiuc

JAMES FORAN, *Fundamentals of Real Analysis,* Marcel Dekker Inc., Pure and Applied Mathematics, no.144, New-York, Basel, Hong-Kong, 1991, VI + 473 pag., ISBN 0 - 8247 - 8453 - 7.

Lucrarea pe care o recenzăm are la bază lecţiile de teoria funcţiilor reale, ţinute de autor pe o perioadă de 16 ani, cuprinzând problematica obişnuită a unui asemenea curs.

Cartea, structurată în 9 capitole, dubutează cu o prezentare sumară a unor noţiuni cu caracter general de teoria mulţimilor, topologie şi ordinale (capitolele 1 - 3), necesare dezvoltării celorlalte capitole.

Capitolul 4 este dedicat studiului mulţimilor Borel şi Baire.

Problemele de bază ale cursului fac obiectul capitolelor 5 - 8. Aici sunt studiate noţiunile de măsură, măsură exterioară, mulţime măsurabilă, funcţie măsurabilă, integrală Lebesgue, spaţii L^p, este prezentată legătura între procesele de derivare şi integrare, este tratată problema derivării funcţiilor de mulţime.

Faţă de alte lucrări cu tematică asemănătoare, prezentul volum cuprinde şi un capitol (capitolul 9) dedicat integralelor Denjoy şi Perron şi legăturii lor cu integrala Lebesgue.

Fiecare secţiune a cărţii se încheie cu un număr apreciabil de exerciţii interesante şi bine alese, care facilitează înţelegerea problemelor teoretice expuse.

Datorită stilului său clar, elegant şi curgător, cartea este accesibilă şi, în acelaşi timp, utilă nu numai matematicienilor, ci şi tuturor celor care folosesc Analiza matematică ca instrument de lucru.

Anca-Maria Precupanu

O.E. FLIPPO, *Stability, duality and decomposition in general mathematical programming*, CWI Tract no.76, Amsterdam, 1991, VII + 228 p., ISBN 90 - 6196 - 398 - 2.

Scopul acestei cărţi este de a pune în evidenţă o gamă variată de algoritmi performanţi, de dată recentă, pentru rezolvarea problemelor de programare matematică cu restricţii date prin inegalităţi sau egalităţi, pe spaţii finit dimensionale. Susţinerea teoretică este făcută în primă parte unde se prezintă rezultate generale de stabilitate - în sensul continuităţii funcţiei valoare, şi de dualitate - din punctul de vedere al analizei convexe, cu referiri şi la cazul neconvex sau unele situaţii speciale. Algoritmii se încadrează în cele două metode principale de descompunere: descompunerea variabilelor, generându-se în acest mod probleme parametrice cu mai puţine variabile, şi descompunerea restricţiilor ca generalizare a cunoscutei metode Dantzig - Wolfe. Aceste metode sunt însoţite de un studiu privind relaţia dintre ele ca metode duale.

Fiecare capitol al cărţii se încheie cu un **Sumar** în care se argumentează importanţa practică a rezultatelor stabilite aducându-se în acelaşi timp o serie de precizări utile. Remarcăm, de asemenea, **Introducerile** la fiecare din cele trei capitole care constituie prezentări din punct de vedere istoric a problematicii.

Monografia se încheie cu un **Index de autori** , un **Index de noţiuni** şi o **Bibliografie** pentru fiecare capitol. Considerăm că această carte este deosebit de utilă în mod special tuturor celor interesaţi în rezolvarea problemelor de programare.

Teodor Precupanu

HALA O. PFLUGFELDER, *Quasigroups and Loops.Introduction.*, Helderman Verlag Berlin, 1990, ISBN 3 - 88538 - 007 - 2.

In this book the author presents from the beginning the basic of the theory of quasigroups and loops. This young and thriving discipline of Mathematics with roots in Geometry (the analyses of web structures), Algebra (the non-associative products) and combinatorics (the Latin Squares) has now a self-contained text written on a introductory level.

In the first chapter the reader will find the basic terminology, notations and results concerning quasigroups and loops, which are needed in subsequent chapters.

An important application of quasigroup and loop theory in the geometry of affine incidence planes is studied in the second chapter. In connection with 3-webs the concept of isotopy of quasigroups and loops is introduced.

The aim of the next chapter is to discuss isotopy and other concepts closely related to its counterpart from a purely algebraic point of view. The most known class of loops (Moufang loops) is the subject of the chapter 4.

The last chapter of this interesting book is devoted to some remarkable class of quasigroups as distributive and entropic quasigroups.

Assuming as a prerequisite only an elementary course in Abstract Algebra this book is accesible to a wide class of readers.

I.Tofan

RYSZARD ENGELKING, KAROL SIEKLUCKI, *Topology. A Geometric Approach, Sigma Series in Pure Mathematics,* Volume 4, Heldermann Verlag Berlin, 1992, 429 pages, ISBN 3 - 88538 - 004 - 8, 148.00.

This book is an introduction to general and to geometric topology. It is not reliant on texts from other branches of mathematics. The Introduction collects together the basic concepts from set theory algebra, anlysis and geometry, which are essential for the purpose of this book.

Chapter 1 is devoted to elementary theory of metric spaces.

Chapter 2 is dedicated to polyhedra. It includes the geometric and topological properties of simplices, the theory of simplicial complexes and their subdivisions, the theory of simplicial maps and an equivalent account of the theory of polyhedra based on cell complexes.

In Chapter 3 the authors develop homotopy theory. They consider the problem of extending continuous maps, fibration and covering theory and the problem of lifting continuous maps. They also develop the theory of the fundamental group.

Chapter 4 is devoted to the topology of Euclidean spaces. Here the authors prove the classical theorems of the invariance of separation and the invariance of the interior point. They present also the elementary introduction to the theory of position and describe a series of examples of sets and mappings.

Chapter 5 is concerned with topological manifolds. Particular attention is paid to the 2 -dimensional manifolds, or surfaces, and their classification.

Chapter 6 continues chapter 1 and is devoted to metric spaces. The authors study two classes of spaces with a regular structure: absolute retracts and absolute neighbourhood retracts, and introduce and study the concept of dimension.

Chapter 7 contains an elementary treatment of general topology. They study the class of compact spaces, paracompact spaces and the metrizability of topological spaces.

This book is of great interest to mathematicians and graduate students.

Corina Mohorianu