

Acquire a solid foundation in all aspects of linear algebra

HANDBOOK OF LINEAR ALGEBRA

Editor-in-Chief

Leslie Hogben, Iowa State University, Ames, USA

Associate Editors

Richard A. Brualdi, University of Wisconsin–Madison, USA

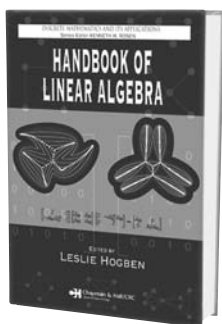
Anne Greenbaum, University of Washington, Seattle, USA

Roy Mathias, University of Birmingham, UK

A volume in the series *Discrete Mathematics and Its Applications*

Edited by **Kenneth H. Rosen**, Monmouth University, West Long Branch, New Jersey, USA

A COMPLETE TREATMENT OF LINEAR ALGEBRA



The **Handbook of Linear Algebra** provides comprehensive coverage of linear algebra concepts, applications, and computational software packages in an easy-to-use handbook format. The esteemed international contributors guide you from the very elementary aspects of the subject to the frontiers of current research.

The book features an accessible layout of parts, chapters, and sections, with each section containing definition, fact, and example segments. The five main parts of the book encompass the fundamentals of linear algebra, combinatorial and numerical linear algebra, applications of linear algebra to various mathematical and non-mathematical disciplines, and software packages for linear algebra computations. Within each section, the facts (or theorems) are presented in a list format and include references for each fact to encourage further reading, while the examples illustrate both the definitions and the facts.

Linearization often enables difficult problems to be estimated by more manageable linear ones, making the **Handbook of Linear Algebra** essential reading for professionals who deal with an assortment of mathematical problems.

Linearization often enables difficult problems to be estimated by more manageable linear ones, making the **Handbook of Linear Algebra** essential reading for professionals who deal with an assortment of mathematical problems.

Features

- Presents basic as well as advanced linear algebra concepts, such as matrix perturbation theory and inverse eigenvalue problems
- Features matrix notation throughout the text
- Covers combinatorial and numerical linear algebra—two important branches of linear algebra
- Explores both mathematical and nonmathematical applications, such as quantum computing, control theory, signal processing, and computational biology
- Discusses software packages useful for linear algebra computations, including MATLAB®, Maple™, and Mathematica®
- Provides numerous references for additional information along with a glossary that covers all major linear algebra terminology

 **Chapman & Hall/CRC**
Taylor & Francis Group

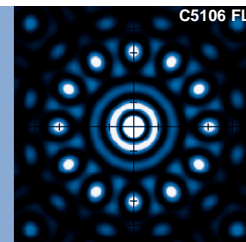
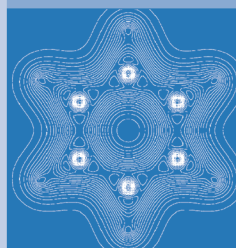
Catalog no. C5106, January 2007, 1400 pp.

ISBN: 978-1-58488-510-8, \$119.95 / £68.99

ORDER ONLINE AT www.crcpress.com

See reverse for continuation of contents and ordering information

NEW!



Contents

LINEAR ALGEBRA

BASIC LINEAR ALGEBRA

Vectors, Matrices and Systems of Linear Equations

Linear Independence, Span, and Bases

Linear Transformations

Determinants and Eigenvalues

Inner Product Spaces, Orthogonal Projection, Least Squares and Singular Value Decomposition

MATRICES WITH SPECIAL PROPERTIES

Canonical Forms

Unitary Similarity, Normal Matrices and Spectral Theory

Hermitian and Positive Definite Matrices

Nonnegative and Stochastic Matrices

Partitioned Matrices

ADVANCED LINEAR ALGEBRA

Functions of Matrices

Quadratic, Bilinear and Sesquilinear Forms

Multilinear Algebra

Matrix Equalities and Inequalities

Matrix Perturbation Theory

Pseudospectra

Singular Values and Singular Value Inequalities

Numerical Range

Matrix Stability and Inertia

TOPICS IN ADVANCED LINEAR ALGEBRA

Inverse Eigenvalue Problems

Totally Positive and Totally Nonnegative Matrices

Linear Preserver Problems

Matrices over Integral Domains

Similarity of Families of Matrices

Max-Plus Algebra

Matrices Leaving a Cone Invariant

COMBINATORIAL MATRIX THEORY AND GRAPHS

MATRICES AND GRAPHS

Combinatorial Matrix Theory

Matrices and Graphs

Digraphs and Matrices

Bipartite Graphs and Matrices

Contents continued – Handbook of Linear Algebra

TOPICS IN COMBINATORIAL MATRIX THEORY

Permanents
D-Optimal Designs
Sign Pattern Matrices
Multiplicity Lists for the Eigenvalues of Symmetric Matrices with a Given Graph
Matrix Completion Problems
Algebraic Connectivity

NUMERICAL METHODS

NUMERICAL METHODS FOR LINEAR SYSTEMS

Vector and Matrix Norms, Error Analysis, Efficiency and Stability
Matrix Factorizations and Direct Solution of Linear Systems
Least Squares Solution of Linear Systems
Sparse Matrix Methods
Iterative Solution Methods for Linear Systems

NUMERICAL METHODS FOR EIGENVALUES

Symmetric Matrix Eigenvalue Techniques
Unsymmetric Matrix Eigenvalue Techniques
The Implicitly Restarted Arnoldi Method
Computation of the Singular Value Decomposition
Computing Eigenvalues and Singular Values to High Relative Accuracy

COMPUTATIONAL LINEAR ALGEBRA

Fast Matrix Multiplication
Structured Matrix Computations
Large-Scale Matrix Computations

APPLICATIONS

APPLICATIONS TO OPTIMIZATION

Linear Programming
Semidefinite Programming

APPLICATIONS TO PROBABILITY AND STATISTICS

Random Vectors and Linear Statistical Models
Multivariate Statistical Analysis
Markov Chains

APPLICATIONS TO ANALYSIS

Differential Equations and Stability
Dynamical Systems and Linear Algebra
Control Theory
Fourier Analysis

APPLICATIONS TO PHYSICAL AND BIOLOGICAL SCIENCES

Linear Algebra and Mathematical Physics
Linear Algebra in Biomolecular Modeling

APPLICATIONS TO COMPUTER SCIENCE

Coding Theory
Quantum Computation
Information Retrieval and Web Search
Signal Processing

APPLICATIONS TO GEOMETRY

Geometry
Some Applications of Matrices and Graphs in Euclidean Geometry

APPLICATIONS TO ALGEBRA

Matrix Groups
Group Representations
Nonassociative Algebras
Lie Algebras

COMPUTATIONAL SOFTWARE

INTERACTIVE SOFTWARE FOR LINEAR ALGEBRA

MATLAB
Linear Algebra in Maple
Mathematica

PACKAGES OF SUBROUTINES FOR LINEAR ALGEBRA

BLAS
LAPACK
Use of ARPACK and EIGS
Summary of Software for Linear Algebra Freely Available on the Web

GLOSSARY

NOTATION INDEX

INDEX

FREE SHIPPING ON ALL ORDERS when you ORDER ONLINE at WWW.CRCPRESS.COM

Please indicate quantities next to the title(s) ordered below:

HANDBOOK OF LINEAR ALGEBRA

.....Catalog no. C5106, ISBN: 978-1-58488-510-8 at \$119.95 / £68.99 each.

Other titles of interest:

HANDBOOK OF DISCRETE AND COMBINATORIAL MATHEMATICS

.....Catalog no. 149, ISBN: 978-0-8493-0149-0 at \$139.95 / £85.00 each.

HANDBOOK OF GRAPH THEORY

.....Catalog no. 8522, ISBN: 978-1-58488-090-5 at \$129.95 / £79.99 each.

HANDBOOK OF DISCRETE AND COMPUTATIONAL GEOMETRY, SECOND EDITION

.....Catalog no. C3014, ISBN: 978-1-58488-301-2 at \$139.95 / £85.00 each.

Ordering Information: Orders must be prepaid or accompanied by a purchase order. Checks should be made payable to CRC Press. Please add the appropriate shipping and handling charge for each book ordered. All prices are subject to change without notice. If purchasing by credit card please be sure to include the 3 digit security code that appears on the back of your card in the "sec code" field provided below. **U.S./Canada:** All orders must be paid in U.S. dollars. TAX: As required by law, please add applicable state and local taxes on all merchandise delivered to CA, CT, FL, KY, MO, NY, and PA. For Canadian orders, please add GST. We will add tax on all credit card orders. **European Orders:** All orders must be paid in U.K. £. VAT will be added at the rate applicable. **Textbooks:** Special prices for course adopted textbooks may be available for certain titles. To review a book for class adoption, contact our Academic Sales Department or submit your textbook evaluation request online at www.crcpress.com/eval.htm **Satisfaction Guaranteed:** If the book supplied does not meet your expectations, it may be returned to us in a saleable condition within 30 days of receipt for a full refund.

SHIPPING AND HANDLING

Region	Delivery Time	First Title	Additional Title	For priority mail services, please contact your nearest CRC PRESS office.
USA/Canada	3-5 Days	\$5.99	\$1.99	
South America	7-14 Days	\$9.99	\$3.99	
Europe	3-5 Days	£2.99	£0.99	
Rest of World	7-21 Days	£4.99	£2.99	

Visa MasterCard American Express Check Enclosed \$

Sec. Code: _____ Exp. Date: _____
Month Year

Signature and Telephone Number required on all orders

Signature..... PO#.....

Telephone.....

If you would like to receive information from us by e-mail, please provide your e-mail address below.

E-Mail Address

Name
please print clearly

Company/Institution.....

Address.....

City State/Province Zip/Postal Code

Country

ORDERING LOCATIONS

In the Americas: CRC PRESS

PO Box 409267
Atlanta, GA 30384-9267
Tel: 1-800-272-7737
Fax: 1-800-374-3401
From Outside the Continental U.S.
Tel: 1-561-994-0555
Fax: 1-561-361-6018
e-mail: orders@taylorandfrancis.com

Rest of the World: CRC PRESS / ITPS

Cheriton House, North Way
Andover, Hants, SP10 5BE, UK
Tel (UK): +44 (0) 1264 34 2926
Tel (Int'l): +44 (0) 1264 34 3070
Fax: +44 (0) 1264 34 3005
e-mail:
(UK): uk.tandf@thomsonpublishingservices.co.uk
(Int'l): international.tandf@thomsonpublishingservices.co.uk

Corporate Offices

CRC PRESS

6000 Broken Sound Parkway, NW, Suite 300
Boca Raton, FL 33487, USA
Tel: 1-800-272-7737
Fax: 1-800-374-3401
From Outside the Continental U.S.
Tel: 1-561-994-0555
Fax: 1-561-361-6018
e-mail: orders@taylorandfrancis.com

CRC PRESS UK

24-25 Blades Court, Deodar Road
London SW15 2NU, UK
Tel: 44 (0) 20 7017 6000
Fax: 44 (0) 20 7017 6747
e-mail: enquiries@crcpress.com

www.crcpress.com

3.1407gtr