



EMS Series of Lectures in Mathematics

Edited by Andrew Ranicki (University of Edinburgh, U.K.)

EMS Series of Lectures in Mathematics is a book series aimed at students, professional mathematicians and scientists. It publishes polished notes arising from seminars or lecture series in all fields of pure and applied mathematics, including the reissue of classic texts of continuing interest. The individual volumes are intended to give a rapid and accessible introduction into their particular subject, guiding the audience to topics of current research and the more advanced and specialized literature.

Previously published in this series:

Katrin Wehrheim, *Uhlenbeck Compactness*

Torsten Ekedahl, *One Semester of Elliptic Curves*

Sergey V. Matveev, *Lectures on Algebraic Topology*

Joseph C. Várilly, *An Introduction to Noncommutative Geometry*

Reto Müller, *Differential Harnack Inequalities and the Ricci Flow*

Eustasio del Barrio, Paul Deheuvels and Sara van de Geer, *Lectures on Empirical Processes*

Iskander A. Taimanov, *Lectures on Differential Geometry*

Martin J. Mohlenkamp, Maria Cristina Pereyra, *Wavelets, Their Friends, and What They Can Do for You*

Stanley E. Payne and Joseph A. Thas, *Finite Generalized Quadrangles*

Masoud Khalkhali, *Basic Noncommutative Geometry*

Helge Holden
Kenneth H. Karlsen
Knut-Andreas Lie
Nils Henrik Risebro

Splitting Methods for Partial Differential Equations with Rough Solutions

Analysis and MATLAB programs



European Mathematical Society

Authors:

Prof. Helge Holden
Department of Mathematical Sciences
Norwegian University of Science and Technology
NO-7491 TRONDHEIM
NORWAY

Prof. Kenneth H. Karlsen
Prof. Nils Henrik Risebro
Centre of Mathematics for Applications
Department of Mathematics
University of Oslo
P.O. Box 1053 Blindern
NO-0316 OSLO
NORWAY

and

Centre of Mathematics for Applications
University of Oslo
P.O. Box 1053 Blindern
NO-0316 OSLO
NORWAY

Prof. Knut-Andreas Lie
Centre for Mathematics of Applications
SINTEF
Department of Applied Mathematics
P.O.Box 124 Blindern
NO-0314 OSLO
NORWAY

Helge Holden har mottatt støtte fra Det faglitterære fond

2010 Mathematics Subject Classification (primary; secondary): 35L65, 35K65, 65M99, 65M15, 65M12; 35L67, 35D30, 47N40, 35A35

Key words: Operator splitting, nonlinear partial differential equations, evolution equations, hyperbolic conservation laws, degenerate convection-diffusion equations, finite difference methods, finite volume methods, front tracking, Matlab codes

ISBN 978-3-03719-078-4

The Swiss National Library lists this publication in The Swiss Book, the Swiss national bibliography, and the detailed bibliographic data are available on the Internet at <http://www.helvetica.ch>.

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in other ways, and storage in data banks. For any kind of use permission of the copyright owner must be obtained.

© 2010 European Mathematical Society

Contact address:
European Mathematical Society Publishing House
Seminar for Applied Mathematics
ETH-Zentrum FLI C4
CH-8092 Zürich
Switzerland

Phone: +41 (0)44 632 34 36
Email: info@ems-ph.org
Homepage: www.ems-ph.org

Printed on acid-free paper produced from chlorine-free pulp. TCF (unendlich)
Printed in Germany

9 8 7 6 5 4 3 2 1