

# Differential Operators on Spaces of Variable Integrability

David E Edmunds, Jan Lang, Osvaldo Méndez



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The theory of Lebesgue and Sobolev spaces with variable integrability is experiencing a steady expansion, and is the subject of much vigorous research by functional analysts, function-space analysts and specialists in nonlinear analysis. These spaces have attracted attention not only because of their intrinsic mathematical importance as natural, interesting examples of non-rearrangement-invariant function spaces but also in view of their applications, which include the mathematical modeling of electrorheological fluids and image restoration.

The main focus of this book is to provide a solid functional-analytic background for the study of differential operators on spaces with variable integrability. It includes some novel stability phenomena which the authors have recently discovered.

At the present time, this is the only book which focuses systematically on differential operators on spaces with variable integrability. The authors present a concise, natural introduction to the basic material and steadily move toward differential operators on these spaces, leading the reader quickly to current research topics.

#### **Contents:**

#### • Preliminaries:

- The Geometry of Banach Spaces
- Spaces with Variable Exponent

#### • Sobolev Spaces with Variable Exponent:

- Definition and Functional-analytic Properties
- Sobolev Embeddings
- Compact Embeddings
- Riesz Potentials
- Poincaré-type Inequalities
- Embeddings
- H?lder Spaces with Variable Exponents
- Compact Embeddings Revisited

#### • The $p(\cdot)$ -Laplacian:

- Preliminaries
- The  $p(\cdot)$ -Laplacian
- Stability with Respect to Integrability

#### • Eigenvalues:

• The Derivative of the Modular

- Compactness and Eigenvalues
- Modular Eigenvalues
- Stability with Respect to the Exponent
- Convergence Properties of the Eigenfunctions
- Approximation on Lp Spaces:
  - *s*-numbers and *n*-widths
  - A Sobolev Embedding
  - Integral Operators

Readership: Graduates and researchers interested in differential operators and function spaces.

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