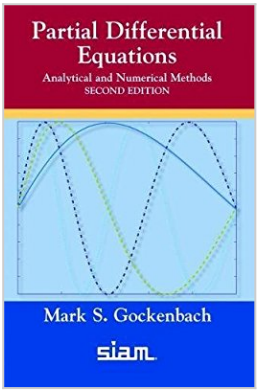


# Partial Differential Equations: Analytical and Numerical Methods, Second Edition

*By Mark S. Gockenbach*



**Partial Differential Equations: Analytical and Numerical Methods, Second Edition** By Mark S. Gockenbach

Partial differential equations (PDEs) are essential for modeling many physical phenomena. This undergraduate textbook introduces students to the topic with a unique approach that emphasizes the modern finite element method alongside the classical method of Fourier analysis.

Additional features of this new edition include broader coverage of PDE methods and applications, with new chapters on the method of characteristics, Sturm-Liouville problems, and Green s functions, and a new section on the finite difference method for the wave equation. The author continues to emphasize Fourier series and finite element methods, which were the primary scope of the first edition.

The book also features emphasis on linear algebra, particularly the idea of best approximation; realistic physical parameters and meaningful experiments for many of the examples and exercises; and tutorials for the most popular software (MATLAB, Mathematica, and Maple) that can be used to reproduce the examples and solve the exercises.

**Audience:** This book is written for undergraduate courses usually titled Introduction to Partial Differential Equations or Fourier Series and Boundary Value Problems.

**Contents:** Preface; Chapter 1: Classification of Differential Equations; Chapter 2: Models in One Dimension; Chapter 3: Essential Linear Algebra; Chapter 4: Essential Ordinary Differential Equations; Chapter 5: Boundary Value Problems in Statics; Chapter 6: Heat Flow and Diffusion; Chapter 7: Waves; Chapter 8: First-Order PDEs and the Method of Characteristics; Chapter 9: Green's Functions; Chapter 10: Sturm-Liouville Eigenvalue Problems; Chapter 11: Problems in Multiple Spatial Dimensions; Chapter 12: More about Fourier Series; Chapter 13: More about Finite Element Methods; Appendix A: Proof of Theorem 3.47; Appendix B: Shifting the Data in Two Dimensions; Bibliography;

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## Editorial Review

Review
I love this book and look forward to using it as a text in the future ... It's the first truly modern approach that I've seen in a PDE text. --Maeve McCarthy, MAA Online

About the Author
**Mark S. Gockenbach** is Professor and Chair of the Department of Mathematical Sciences at Michigan Technological University. He is the author of *Partial Differential Equations: Analytical and Numerical Methods* (SIAM, 2002), *Understanding and Implementing the Finite Element Method* (SIAM, 2006), and *Finite-Dimensional Linear Algebra* (CRC Press, 2010). His research interests include inverse problems in PDEs and numerical methods and software for large-scale optimization problems.

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