



# Solution Techniques for Elementary Partial Differential Equations, Second Edition (Chapman Hall/CRC Mathematics)

*By Christian Constanda*

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## **Solution Techniques for Elementary Partial Differential Equations, Second Edition (Chapman Hall/CRC Mathematics)** By Christian Constanda

Incorporating a number of enhancements, **Solution Techniques for Elementary Partial Differential Equations, Second Edition** presents some of the most important and widely used methods for solving partial differential equations (PDEs). The techniques covered include separation of variables, method of characteristics, eigenfunction expansion, Fourier and Laplace transformations, Green's functions, perturbation methods, and asymptotic analysis.

### **New to the Second Edition**

- New sections on Cauchy–Euler equations, Bessel functions, Legendre polynomials, and spherical harmonics
- A new chapter on complex variable methods and systems of PDEs
- Additional mathematical models based on PDEs
- Examples that show how the methods of separation of variables and eigenfunction expansion work for equations other than heat, wave, and Laplace
- Supplementary applications of Fourier transformations
- The application of the method of characteristics to more general hyperbolic equations
- Expanded tables of Fourier and Laplace transforms in the appendix
- Many more examples and nearly four times as many exercises

This edition continues to provide a streamlined, direct approach to developing students' competence in solving PDEs. It offers concise, easily understood explanations and worked examples that enable students to see the techniques in action. Available for qualifying instructors, the accompanying solutions manual includes full solutions to the exercises. Instructors can obtain a set of template questions for test/exam papers as well as computer-linked projector files directly from the author.

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### **Review**

**Solution Techniques for Elementary Partial Differential Equations** is an interesting read. ... Some of the worked-out examples cover not only the conventional topics of heat and wave problems but also applications to a wide variety of fields, from stock markets to Brownian motion. ... Each chapter has many problems for practice, with solutions for some of them provided at the very end. The book is well written, concise, has adequate examples and can be used as a textbook for beginners to learn the techniques of PDE solvers.

?*MAA Reviews*, January 2011

This concise, well-written book, which includes a profusion of worked examples and exercises, serves both as an excellent text in undergraduate and graduate learning and as a useful presentation of solution techniques for researchers and engineers interested in applying partial differential equations to real-life problems.

?Barbara Zubik-Kowal, Boise State University, Idaho, USA

The author, a skilled classroom performer with considerable experience, understands exactly what students want and has given them just that: a textbook that explains the essence of the method briefly and then proceeds to show it in action. ... In my opinion, this is quite simply the best book of its kind that I have seen thus far. The book not only contains solution methods for some very important classes of PDEs, in an easy-to-read format, but is also student-friendly and teacher-friendly at the same time. It is definitely a textbook that should be adopted.

?From the Foreword by Peter Schiavone, University of Alberta, Edmonton, Canada

### **Praise for the First Edition**

The book contains a large number of worked examples and exercises. ... Useful for the ... student who might be interested ... in learning the manipulating skills of solution methods of first- and second-order partial differential equations.

?*Zentralblatt MATH*, 1042

Winner of a 2002 *CHOICE* Outstanding Academic Title Award!

... an easy-to-read and straight-to-the-point book for all those who want to familiarize themselves with concepts and solution techniques for partial differential equations ... A writing style special to this author is the complete departure from the arid theorem-proof approach to PDEs. Abstract concepts are carefully explained and supported with a wealth of remarks, application-oriented illustrations, and a wonderful collection of problems, a few elementary enough for any beginner. On the whole, the material is very well presented; this is one of the best books on elementary PDEs this reviewer has read so far. Highly recommended.

?*CHOICE*, October 2002

... successfully addresses a difficult problem of undergraduate teaching: how to make students understand and become adept at using a class of practical tools that are essential in the study of many mathematical models ... clear, concise, and easy to read?places the emphasis on worked examples and exercises ... . Someone who needs a book that goes straight to the point and shows what partial differential equations are

and how they can be solved, should find this textbook to be one of the best suited for the purpose.

?Barbara Bertram, Michigan Technological University, Houghton, USA

... Students in such disciplines who need a book that gives them the required knowledge in an easily understandable, yet rigorous, manner will find Christian Constanda's book an invaluable resource. ... The fact that no computing devices are needed to work through this text is a distinct advantage ... an ideal tool for students taking a first course in PDEs, as well as for the lecturers who teach such courses.

?Marian Aron, Plymouth University, UK

#### About the Author

**Christian Constanda** is the Charles W. Oliphant Endowed Chair in Mathematical Sciences in the Department of Mathematical and Computer Sciences at the University of Tulsa. He is also an Emeritus Professor at the University of Strathclyde in Glasgow, UK.

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