# Introduction to Numerical Programming: A Practical Guide for Scientists and Engineers Using Python and C/C++ (Series in Computational Physics)

*By Titus A. Beu*

**Introduction to Numerical Programming: A Practical Guide for Scientists and Engineers Using Python and C/C++ (Series in Computational Physics)**
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Makes Numerical Programming More Accessible to a Wider Audience

Bearing in mind the evolution of modern programming, most specifically emergent programming languages that reflect modern practice, Numerical Programming: A Practical Guide for Scientists and Engineers Using Python and C/C++ utilizes the author's many years of practical research and teaching experience to offer a systematic approach to relevant programming concepts. Adopting a practical, broad appeal, this user-friendly book offers **guidance to anyone interested in using numerical programming to solve science and engineering problems. Emphasizing methods generally used in physics and engineering?from elementary methods to complex algorithms?it gradually incorporates algorithmic elements with increasing complexity.**

Develop a Combination of Theoretical Knowledge, Efficient Analysis Skills, and Code Design Know-How

The book encourages algorithmic thinking, which is essential to numerical analysis. Establishing the fundamental numerical methods, application numerical behavior and graphical output needed to foster algorithmic reasoning, coding dexterity, and a scientific programming style, it enables readers to successfully navigate relevant algorithms, understand coding design, and develop efficient programming skills. The book incorporates real code, and includes examples and problem sets to assist in hands-on learning.

- Begins with an overview on approximate numbers and programming in Python and C/C++, followed by discussion of basic sorting and indexing methods, as well as portable graphic functionality
- Contains methods for function evaluation, solving algebraic and transcendental equations, systems of linear algebraic equations, ordinary differential equations, and eigenvalue problems
- Addresses approximation of tabulated functions, regression, integration of one- and multi-dimensional functions by classical and Gaussian quadratures, Monte Carlo integration techniques, generation of random variables, discretization methods for ordinary and partial differential equations, and stability analysis

This text introduces platform-independent numerical programming using Python and C/C++, and appeals to advanced undergraduate and graduate students in natural sciences and engineering, researchers involved in scientific computing, and engineers carrying out applicative calculations.

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Review

"This book is written for advanced undergraduate and graduate students in natural sciences and engineering for a one- or two-semester course. The material presented includes many topics treated in a numerical analysis course and contains a lot of coding examples in Phyton, and C/C++. ... The value of the book lies in the presentation of the programming and a program example on almost every second page."
?Gudula Rünger, *Zentralblatt MATH*, 1308

"In a relatively crowded field of numerical programming books, this is the only one to include both Python and C code examples. … a good reference for a one- or two-semester course for advanced undergraduate students or for graduate students in science or engineering."
?*Optics & Photonics News*, 2015

"Working through this book you will become an expert in numerical techniques … . Your journey will be a real pleasure since the book focuses on thorough explanations, hands-on code examples, and graphical representations."
?Professor Dr. Alexander K. Hartmann, Institute for Physics, University of Oldenburg

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?Professor Michel Mareschal, Department of Physics, Université Libre de Bruxelles

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?Professor Joan Adler, Technion, Israel Institute of Technology

"… a comprehensive introduction to classical numerical methods for advanced-level undergraduate students in the physical sciences, engineering, and applied mathematics. The book is novel in teaching both numerics and the art of programming, via clear and simple codes in Python and C/++. … I will recommend it to my students."
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"This book is unique in providing an introduction to [numerical methods, programming languages, and graphics]. Each topic is clearly explained and can be practiced using ready-made computer programs."
?Professor R.I. Campeanu, York University, Toronto

About the Author

**Titus Adrian Beu**, professor of theoretical and computational physics at the University "Babes-Bolyai" from

Cluj-Napoca, Romania, has been active in the broader field of computational physics for more than 30 years. His research topics have evolved from Tokamak plasma and nuclear reactor calculations in the 1980s, collision theory and molecular cluster spectroscopy in the 1990s, to fullerenes and nanofluidics simulations in recent years. Development of ample computer codes has been at the core of all research projects the author has conducted. In parallel, he has lectured on general programming techniques and advanced numerical methods, general simulation methods, and advanced molecular dynamics.

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