



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2016; 2(2): 606-607  
www.allresearchjournal.com  
Received: 25-12-2015  
Accepted: 26-01-2016

**Dr. Premila Kollur**  
Assistant Professor of  
Mathematics, Government  
Women's First Grade College,  
Jewargi Colony, Kalaburgi

## Applications of numerical analysis in computational science

**Dr. Premila Kollur**

### Abstract

In the pre-computer era, the time and drudgery of implementing such calculations seriously limited their practical use. However, with the advent of fast, inexpensive digital computers, the role of numerical methods in engineering and scientific problem solving has exploded. In this paper we study the applications of numerical analysis in computational science.

**Keywords:** Numerical methods, computer.

### 1. Introduction

Numerical analysis is the area of mathematics and computer science that creates, analyzes, and implements algorithms for solving numerically the problems of continuous mathematics. Such problems originate generally from real-world applications of algebra, geometry and calculus, and they involve variables which vary continuously; these problems occur throughout the natural sciences, social sciences, engineering, medicine, and business. During the past half-century, the growth in power and availability of digital computers has led to an increasing use of realistic mathematical models in science and engineering, and numerical analysis of increasing sophistication has been needed to solve these more detailed mathematical models of the world. The formal academic area of numerical analysis varies from quite theoretical mathematical studies to computer science issues. With the growth in importance of using computers to carry out numerical procedures in solving mathematical models of the world, an area known as scientific computing or computational science has taken shape during the 1980s and 1990s. It is concerned with using the most powerful tools of numerical analysis, computer graphics, symbolic mathematical computations, and graphical user interfaces to make it easier for a user to set up, solve, and interpret complicated mathematical models of the real world.

### 2. Modern Applications

Numerical analysis and mathematical modeling have become essential in many areas of modern life. Sophisticated numerical analysis software is being embedded in popular software packages, e.g. spreadsheet programs, allowing many people to perform modeling even when they are unaware of the mathematics involved in the process. Computer aided design (CAD) and computer aided manufacturing (CAM) are important areas within engineering, and some quite sophisticated PSEs have been developed for CAD/CAM. A wide variety of numerical analysis is involved in the mathematical models that must be solved. The models are based on the basic Newtonian laws of mechanics; there are a variety of possible models, and research continues on designing such models. An important CAD topic is that of modeling the dynamics of moving mechanical systems.

Numerical methods greatly expand the types of problems you can address. They are capable of handling large systems of equations nonlinearities, and complicated geometries that are not uncommon in engineering and science and that are often impossible to solve analytically with standard calculus. As such they greatly enhance your problem-solving skills. Numerical methods provide a vehicle for you to reinforce your understanding of mathematics. Because one function of numerical methods is to reduce higher mathematics to basic arithmetic operations. They get at the "nuts and bolts" of some otherwise obscure topics. Enhanced understanding and insight can result from this alternative perspective.

**Correspondence**  
**Dr. Premila Kollur**  
Assistant Professor of  
Mathematics, Government  
Women's First Grade College,  
Jewargi Colony, Kalaburgi

Numerical methods are an efficient vehicle for learning to use computers. Because numerical methods are expressly designed for computer implementation they are ideal for illustrating the computer's powers and limitations. When you successfully implement numerical methods on a computer, and then apply them to solve otherwise intractable problems, you will be provided with a dramatic demonstration of how computers can serve your professional development. At the same time, you will also learn to acknowledge and control the errors of approximation that are part and parcel of large-scale numerical calculations.

### 3. Reference

1. Anderson E. LAPACK User's Guide, SIAM Pub, 1992.
2. Ascher U, Petzold L. Computer Methods for Ordinary Differential Equations and Differential-Algebraic Equations, SIAM Pub, 1998.
3. Atkinson K. An Introduction to Numerical Analysis, 2nd ed., John Wiley Pub., 1989.
4. Atkinson K. The Numerical Solution of Integral Equations of the Second Kind, Cambridge Univ. Press, 1997.
5. Atkinson K, Han W. Theoretical Numerical Analysis: A Functional Analysis Framework, Springer-Verlag, 2001.