Applied Mathematics and Mathematical Modeling

Joseph Malkevitch, York College (CUNY), Chair
Ricardo Cortez, Tulane University
Michael A. Jones, Mathematical Reviews

Introduction

In the last ten years the pattern of the prior sixty years rapid growth in both the theory and range of uses for applied and applicable mathematics has continued, and accelerated. Examples of situations where applied mathematics has had important influence and where new applications are emerging rapidly include:

cell phones and global positioning systems
medical imaging
weather and climate modeling
financial mathematics
mechanism design, market design, and auctions
web searching, routing, and sensor networks
extracting information, such as genome data, from large data sets

These areas have drawn on mathematical tools from both classical applied mathematics and discrete applied methodologies. The tremendous increase in storage and speed of computers has revitalized many areas of applied mathematics because, with computer power now available, problems can be pushed towards solutions in ways that were formerly impossible.

Serving students

In recent years roughly 18,000 undergraduate degrees in mathematics and allied areas have been awarded; the analogous
respectively. Thus the overwhelming majority of students who receive mathematics degrees enter the world of work, whether or not their jobs use their mathematical training. In addition, many mathematics majors who continue to graduate work do so in areas traditionally allied with mathematics: physics, engineering, computer science, biology, economics, finance, etc. These data argue that *all* students should acquire skills in mathematical modeling, knowledge of theory accepted as useful in applied mathematics, and a broad sense of where mathematics is being applied. Such students will be more successful either in chosen careers or as they pursue higher degrees beyond pure mathematics.

Calculus and Linear Algebra courses, for example, have plenty of theory to fill up any course time available. But such courses should, at minimum, present examples of where the material being discussed is applicable. In Linear Algebra, instructors shou

Because colleges vary greatly in size, presence or absence of graduate or engineering programs, access to local industry and business, and other dimensions, it is difficult to offer more than general guidance to departments seeking to establish or improve applied programs. To give some indication of the range of courses now required for in existing applied mathematics majors, minors, and concentrations, we present a table of information compiled for the SIAM Education ergraduate degree programs in applied mathematics.

	Major	**Minor/Concentration**
Required courses	Calculus sequence Differential equations Linear algebra Introduction to proofs Real analysis Numerical analysis Applied math or Modeling Probability Statistics Abstract algebra Introduction to programming Int. object-oriented languages	Calculus sequence