

<<数学建模方法与分析>>

图书基本信息

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前言

Mathematical modeling is the link between mathematics and the rest of the world. You ask a question. You think a bit, and then you refine the question, phrasing it in precise mathematical terms. Once the question becomes a mathematics question, you use mathematics to find an answer. Then finally (and this is the part that too many people forget), you have to reverse the process, translating the mathematical solution back into a comprehensible, no-nonsense answer to the original question. Some people are fluent in English, and some people are fluent in calculus. We have plenty of each. We need more people who are fluent in both languages and are willing and able to translate. These are the people who will be influential in solving the problems of the future. This text, which is intended to serve as a general introduction to the area of mathematical modeling, is aimed at advanced undergraduate or beginning graduate students in mathematics and closely related fields. Formal prerequisites consist of the usual freshman-sophomore sequence in mathematics, including one-variable calculus, multivariable calculus, linear algebra, and differential equations. Prior exposure to computing and probability and statistics is useful, but is not required.

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### 内容概要

本书提出了一种通用的数学建模方法——五步方法。

帮助读者迅速掌握数学建模的真谛。

作者以引人入胜的方式描述了数学模型的3个主要领域：最优化、动力系统和随机过程。

本书以实用的方法解决各式各样的现实问题，包括空间飞船的对接、传染病的增长率和野生生物的管理等。

此外，本书根据需要详细介绍了解决问题所需要的数学知识。

本版新增内容：增加了关于时间序列分析和扩散模型的新节。

关注国际性问题，如经济预测、人口控制、蓄水池。

此外，更新了最优化问题。

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## 章节摘录

Problems in optimization are the most common applications of mathematics. Whatever the activity in which we are engaged, we want to maximize the good that we do and minimize the unfortunate consequences or costs. Business managers attempt to control variables in order to maximize profit or to achieve a desired goal for production and delivery at a minimum cost. Managers of renewable resources such as fisheries and forests try to control harvest rates in order to maximize long-term yield. Government agencies set standards to minimize the environmental costs of producing consumer goods. Computer system managers try to maximize throughput and minimize delays. Farmers space their plantings to maximize yield. Physicians regulate medications to minimize harmful side effects. What all of these applications and many more have in common is a particular mathematical structure. One or more variables can be controlled to produce the best outcome in some other variable, subject in most cases to a variety of practical constraints on the control variables. Optimization models are designed to determine the values of the control variables which lead to the optimal outcome, given the constraints of the problem. We begin our discussion of optimization models at a place where most students will already have some practical experience. One-variable optimization problems, sometimes called maximum-minimum problems, are typically discussed in first semester calculus. A wide variety of practical applications can be handled using just these techniques. The purpose of this chapter, aside from a review of these basic techniques, is to introduce the fundamentals of mathematical modeling in a familiar setting.

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### 媒体关注与评论

“这是一本很好的教学建模教科书，其中的数学知识非常有用，符合本科生数学建模课程的教学要求。”  
——John E Doner.加州大学圣芭芭拉分校数学系

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