out of date. Dean does not treat the important generalized optical theorem of Mueller and its immensely successful applications to inclusive reactions. This volume is based on lectures that the author gave in the mid- to late-1960's and unfortunately is true to its origins.

This shortcoming of the book is even more regretable when one sees how well Dean does discuss the material that he has included. The book begins with an excursion into group theory, introducing the student to SU_3 by first passing through the more familiar territory of rotations and isospin. Dean presents a very fine introduction to the quark model, including most of what a non-expert needs to know about spin and SU_6. The discussion of SU_N groups is sufficiently detailed that the student should have little trouble extending to SU_4 and beyond, what has been learned about SU_3.

Part II of the text concerns itself with analyticity. One feature that I found especially gratifying was the clear treatment of bound states and resonance poles. The last part of the book considers Regge theory and briefly touches upon such arcane topics as sense and nonsense, conspiracy and evasion. Even here the author's style is light and clear.

The material treated is always treated well, and I found the book a better introduction to the subject than other existing texts, for example, R. J. Eden's *High Energy Collisions of Elementary Particles* (Cambridge U.P., 1975). If a student is interested in this particular aspect of strong interactions, I would recommend Dean's book, but for a general introduction I would search for a much more up-to-date one.

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Mathematical Modeling and Digital Simulation for Engineers and Scientists

J. S. Smith
322 pp. Wiley-Interscience, New York, 1977. $21.00

In this book J. M. Smith describes numerical procedures for solving continuous and discrete processes. The first chapter contains background information that makes the book readable to large classes of people without an engineering background. It includes a discussion of linear ordinary differential equations with many examples included. Beyond the standard theory one is introduced to the whole notion of a frequency domain and the use of Fourier and Laplace transforms. This chapter in particular is well written with many examples and illustrations. The use of block diagrams and transfer functions are described in detail.

In the second chapter the ideas of the first chapter are extended to difference equations rather than differential equations. The discussion of the various types of errors is slightly confusing as it is never precisely defined. The fundamental use of the Z transform is introduced in this chapter, and tables are included for the Z transform of many common functions. Applications to discrete systems are given.

The heart of the book, the numerical solution of ordinary differential equations, begins in chapters three and four. The former concerns itself mainly with the concept of stability. One defect is that the description is mainly by examples and no general definitions are given, thus making the extension to systems of equations harder to follow. In the following chapter both discrete and hybrid approximations are considered and the important phenomena of aliasing is introduced. Then difference approximations to the continuous differential equations are introduced based on the Z transform. As before, extensive diagrams help ease the reader through the various steps. Chapter four also contains a detailed description of Fowler's method, which is based on the poles of the transfer function. Smith advocates the use of this method for simulating linear systems with embedded nonsingularities.

The method of root matching for generating approximations to the differential equation is discussed in the next chapter. As before, the emphasis is on matching properties of the differential and difference equations. A description of Shannon's method and filtering is also included in this chapter.

In chapter six Smith discusses the extension of the previous methods based on the transfer function to nonlinear systems of differential equations. Several examples illustrate the use of the Jacobian in resolving the nonlinearities. This linearization, coupled with an explicit solution of the linear equation, is derived in detail.

Chapter seven is what Smith terms "Modern Numerical Integration Methods." He develops general algorithms and demonstrates that many of the classical formulas are special cases of this algorithm. These free parameters are then chosen so as to tone the difference scheme to the particular differential equations. In particular, parameters that minimize the variance propagation of the white noise response are presented. Phase characteristics are also discussed as to their impact on the choice of parameters.

In chapter eight so-called "classical" numerical methods are presented, both for integration and for differential equations. The presentation is straightforward and the detailed illustrations of previous chapters are no longer used. Smith presents in the last chapter some methods for speeding up evaluations based on the use of Chebyshev polynomials (sometimes known as economization).

In general the book is well written and the first part of the book especially has many examples and illustrations that make the book very readable. The lack of exercises is regrettable and might affect the choice of this book as a text for a class. The book is mainly designed for simulation engineers and real time work. Even in this case the use of precise definitions for many of the concepts would have improved the situation. The use of modern software for solving differential equations is not mentioned at all. These packages automatically choose the timestep and order of the scheme so as to (hopefully) maximize their efficiency. The formal accuracy of the schemes presented are not extensively discussed, and Smith admits that there is so far relatively little experience with the nonlinear equations. Furthermore, the concept of stiffness, now playing an increasingly important role in the modern theory, is not discussed at all.

In summary, the book is quite readable and very useful with many unusual approaches, but should only be used for a course in conjunction with more standard, modern books such as those by Lambert (Wiley, 1973), Gear, Lapidus and others.

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Principles and Applications of Ferroelectrics and Related Materials

M. E. Lines, A. M. Glass
680 pp. Clarendon (Oxford U.P.), Oxford, 1977. $49.50

In 1959 William Cochran pointed out the fundamental relationship between lattice dynamics and the ferroelectric phase transition. The basic idea is the so-called "soft-mode" concept, which can be described as follows: as the temperature is